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INITIAL STUDY/PROPOSED NEGATIVE DECLARATION SAMDA WATER EXPLORATION FREMONT VALLEY RANCH WATER MANAGEMENT PROJECT

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Prepared for:

LOS ANGELES DEPARTMENT OF WATER AND POWER
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Los Angeles, California 90051

Prepared by:

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AA

NOTICE OF DETERMINATION -- DRAFT MITIGATED NEGATIVE DECLARATION

Project Title: SAMDA Water Exploration, Fremont Valley Ranch Water Management
Project Location: Three miles southwest of the community of Cantil
County: Kern

Project Proponent: SAMDA, Inc.

Project Description:
The proposed project of SAMDA, Inc. includes pumping groundwater from SAMDA Water Exploration's Fremont Valley Ranch (FVR), and making it available for delivery to the Second Los Angeles Aqueduct where it will be used to supplement existing Department of Water and Power (LADWP) flows. The FVR comprises approximately 2,312 acres of primarily abandoned farmland approximately 20 miles north northeast of the town of Mojave and 3 miles southwest of the community of Cantil in Kern County. Proposed facilities include four wells, approximately 3.4 miles of well collection pipelines, a pump station with an underground forebay, and a high-pressure connection to the aqueduct. Facilities will be sized to deliver from 8,000 to 12,000 acre-feet per year with an anticipated average yield of 10,000 acre-feet per year of groundwater to the aqueduct during pumping over a ten-month period each year.

As Lead Agency, the LADWP is preparing a Mitigated Negative Declaration for the above-named project. This Notice of Determination is hereby sent in compliance with the State of California guidelines for implementation of the California Environmental Quality Act.

LADWP requests input from your agency regarding the scope and content of the environmental information that is germane to your agency's statutory responsibilities regarding with the proposed project.

Time constraints mandated by State law require your response at the earliest possible date, but not later than 30 days after receipt of this Notice. Please designate a contact person in your agency and send your response to the Peter Kavounas, Environmental and Legal Issues Group, Water Resources Section, Department of Water and Power, City of Los Angeles, 111 North Hope Street, Room 1469, Los Angeles, California 90012-5701 (phone: 213-367-1032).

The Draft Mitigated Declaration will be available for review at the following locations:

Los Angeles City Clerk's Office Room 607, City Hall East Los Angeles, CA 90012	Kern County Clerk's Office 115 Truxtun Avenue Bakersfield, CA 93301	Antelope Valley-East Kern Water Agency 6500 West Avenue N Palmdale, CA 93551

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1.0 INTRODUCTION

The proposed project involves the development of a supplemental groundwater supply for the City of Los Angeles. The proposed groundwater supply source is located at SAMDA Water Exploration's Fremont Valley Ranch (FVR) located near the community of Cantil in Kern County, California.

1.1 PROJECT LOCATION AND SETTING

The Fremont Valley Ranch property consists of 2,312 acres located adjacent to State Highway 14, approximately 20 miles north-northeast of the town of Mojave, CA (Figures 1-1 and 1-2). The property is traversed by State Highway 14, Southern Pacific Railroad tracks, the second LADWP aqueduct and LADWP high voltage transmission lines (Figure 1-3). Abandoned farming operations lie to the north and east, with relatively undisturbed land to the south and west. The land surface is generally level throughout the previously farmed areas, but elevations west of Highway 14 rise dramatically to the northwest, forming the southernmost portion of the Sierra Nevada Mountain range. The Garlock fault trends in a northeast/southwesterly direction, immediately west of the ranch and the Cantil fault bisects the property also in a northeast/southwesterly direction.

1.2 PURPOSE AND NEED FOR THE PROPOSED PROJECT

The LADWP has faced increasing cutbacks from its Mono Basin and Owens Valley supply. Additionally, supplemental sources purchased from the Metropolitan Water District of Southern California's Colorado River Aqueduct are increasingly jeopardized by other lower basin states claiming their allotment. Issues surrounding the Bay-Delta also pose problems for an agency charged to ensure a reliable water supply for southern California. With this in mind, the LADWP seeks to augment the supplies available to it by purchasing water from SAMDA's 2,312 acre Fremont Valley Ranch located near the town of Cantil in Kern County, California.

1.2.1 City of Los Angeles Water Supplies

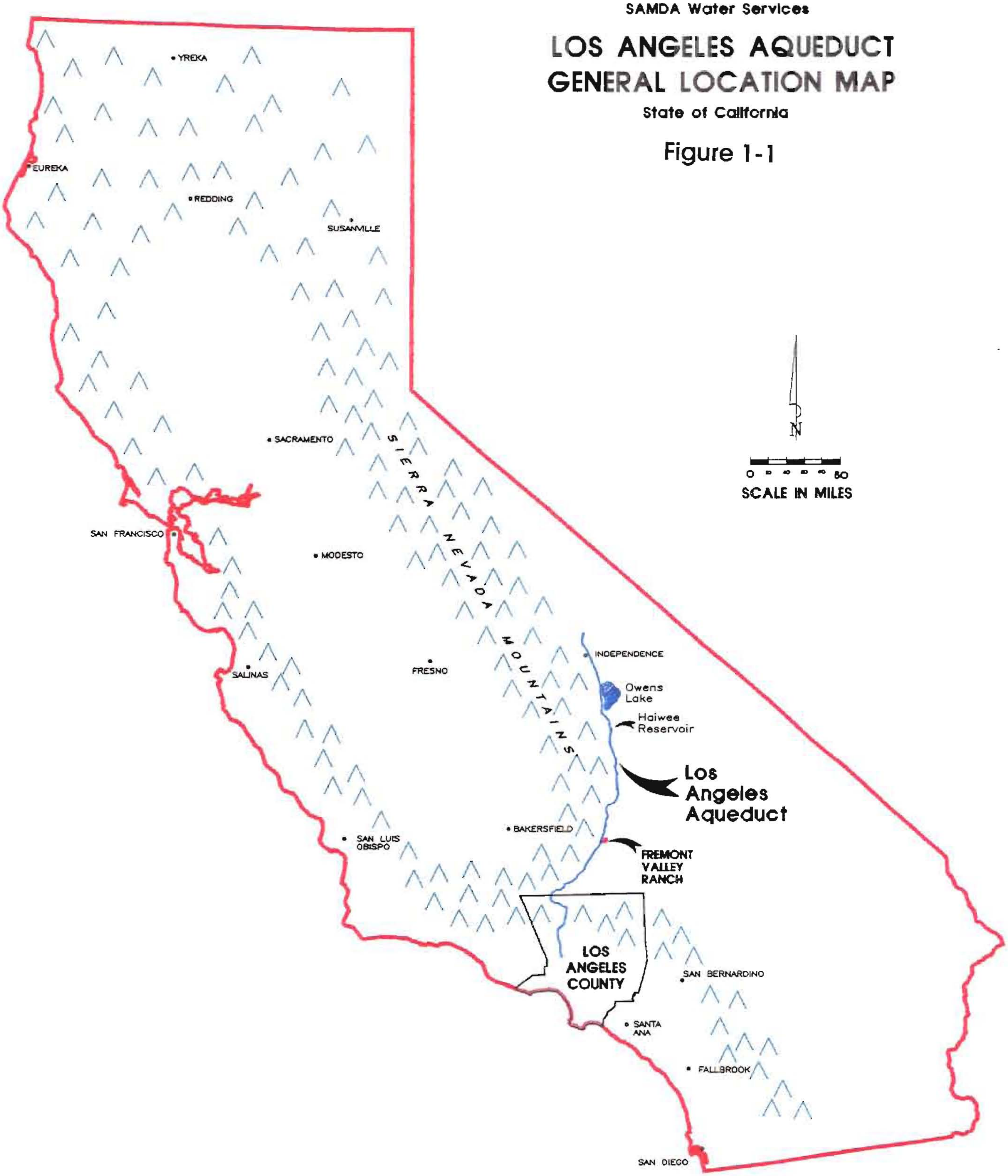
The LADWP is the water purveyor for the City of Los Angeles. The LADWP obtains water from three principal sources: the Los Angeles Aqueduct, local groundwater, and the Metropolitan Water District of Southern California (Metropolitan).

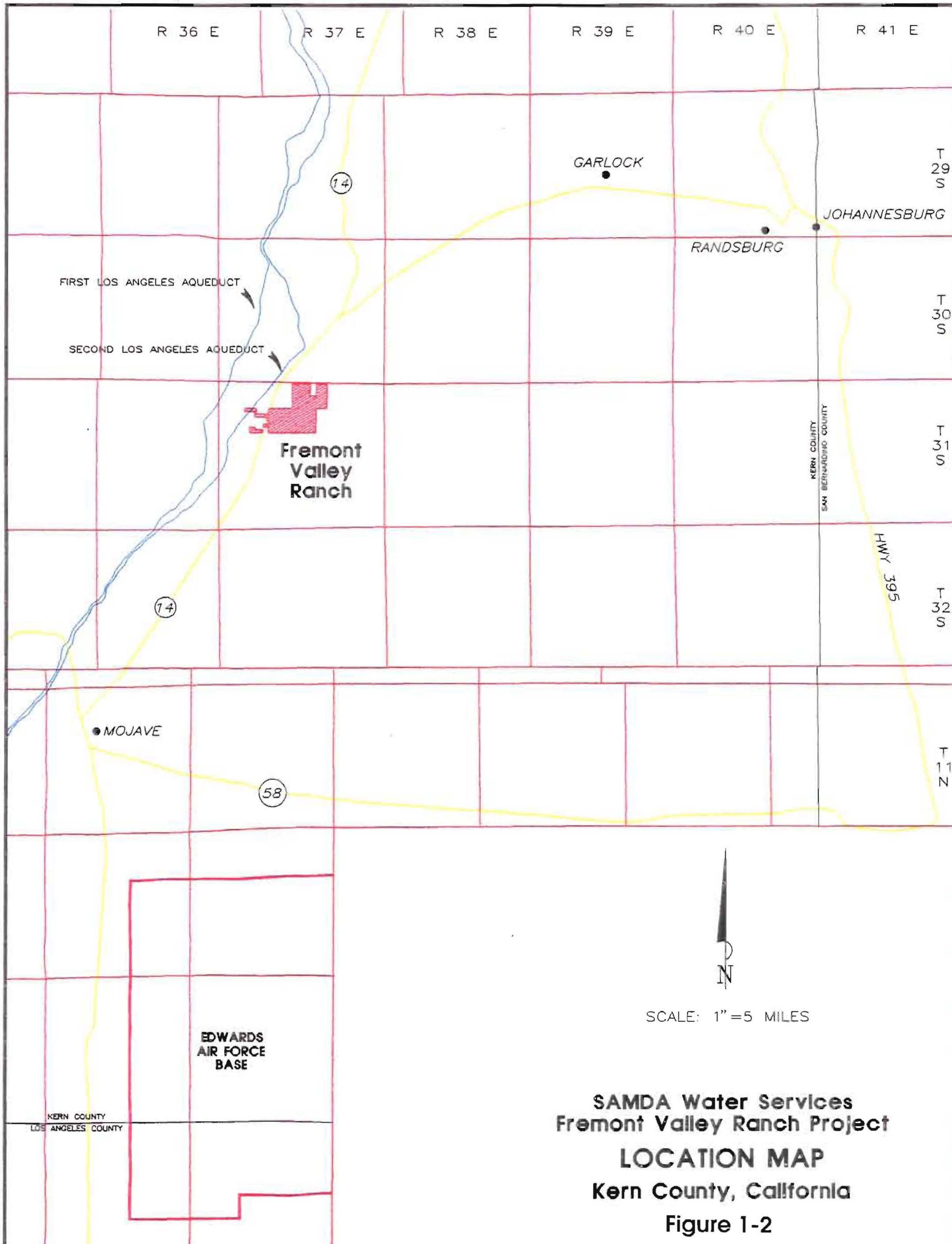
SAMDA Water Services

LOS ANGELES AQUEDUCT GENERAL LOCATION MAP

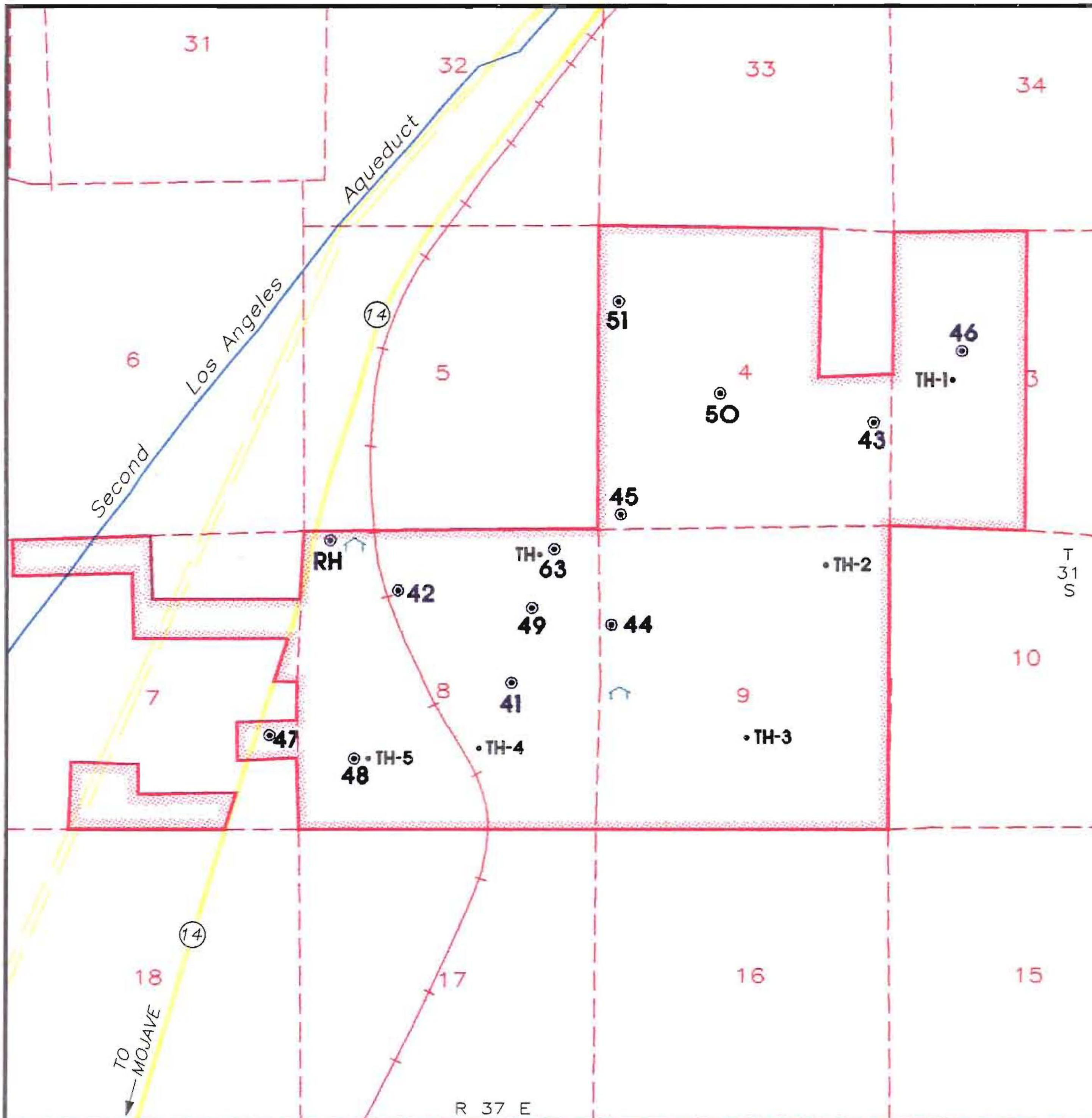
State of California

Figure 1-1





SAMDA Water Services
Fremont Valley Ranch Project
LOCATION MAP
Kern County, California
Figure 1-2



LEGEND

63 EXISTING PRODUCTION WELL

TH-1 TEST HOLE

TRANSMISSION LINE

RAILROAD

RANCH PROPERTY

HAY BARNS

N

SCALE: 1" = 1/2 Mile
DATE: JULY 1997

SAMDA Water Services
Fremont Valley Ranch Project

EXISTING FACILITIES MAP

Kern County, California

Figure 1-3

Los Angeles Aqueduct Supply. The Los Angeles Aqueduct (LAA) is the original source of imported water to the Los Angeles area. The LAA facilities originate in the Mono Basin and Owens Valley approximately 200 miles north of Los Angeles, and convey water to the San Fernando Valley. The LAA is owned and operated by the Los Angeles Department of Water and Power. The initial facilities of the LAA were constructed in 1913. The primary source of water for this first aqueduct was surface water diverted from the Owens River. In 1940, improvements to the aqueduct were completed which extended the aqueduct into the Mono Basin. A second aqueduct with an additional capacity of 200,000 acre-ft/yr was completed in 1970. The second aqueduct derived water from increased surface water diversions from Owens Valley and the Mono Basin, and groundwater extraction from Owens Valley.

In the period of 1970 to 1990, the City of Los Angeles imported approximately 450,000 acre-ft/yr from the LAA. A maximum of approximately 542,000 acre-ft was imported in 1983-1984. Export volumes from the LAA have been the subject of litigation which have reduced the supply available to the LAA. Additional limitations on exports may result from water being used for the rewatering of the Lower Owens River and dust control on Owens Lake.

Future Yield of the Los Angeles Aqueduct. Based on an evaluation of the Inyo County/City of Los Angeles Owens Valley Agreement, and the most probable Mono Basin yield, it is estimated that the average yield of the LAA may be approximately 350,000 acre-ft/yr. Because of the nature of the Owens Valley and Mono Basin environmental concerns, it is anticipated that there will be significant variation between wet and dry years.

Based on the Draft Environmental Impact Report for the Inyo County/City Agreement (1990) and discussions with LADWP Planning staff, wet year yield (i.e. repeat of 1978, '80, '82, '83 or '86 hydrologic conditions) from the LAA may be as much as 500,000 acre-ft, or 132 percent of average yield. Dry year yield may be as low as 125,000 acre-ft, or 25 percent of average yield.

Local Groundwater Supplies. The LADWP obtains groundwater from four local groundwater basins: San Fernando Basin, Sylmar Basin, Central Basin, and West Coast Basin. The LADWP's groundwater extraction rights total 112,000 acre-ft/yr as shown in Table 1-1. Groundwater rights will range from the current 112,000 to 132,000 acre-ft/yr by the year 2010. This increase is based upon credits given for imported water and reclaimed water used in the San Fernando Basin and returned to groundwater by natural percolation.

Metropolitan Water District of Southern California Supplies. The LADWP purchases imported water from Metropolitan to supplement its LAA and local groundwater supplies. Metropolitan is a wholesale water agency which obtains supplies from the Colorado River and the State Water Project (SWP) and provides financial incentives for local , primarily water reclamation projects. Metropolitan serves supplemental imported water to most of metropolitan Southern California. Since 1970, LADWP has purchased an average of 125,000 acre-ft/yr from Metropolitan, comprising approximately 20 percent of the total supply. However, annual purchases from Metropolitan can vary significantly depending on the need to supplement LAA deliveries if dry conditions exist. For example, during the drought of 1987-1992, Metropolitan supplied more than 60 percent of the LADWP demand.

Total Supply. The total water demand in the LADWP service area was 614,500 acre-ft in the 1995-96 fiscal year (LADWP, 1997). The average annual supplies are summarized in Table 1-1.

TABLE 1-1
SUMMARY OF LOS ANGELES WATER SUPPLIES

Source	Avg. Annual Supply (acre-ft/yr)
Los Angeles Aqueduct	400,000
Local Surface and Groundwater	95,000[1]
Metropolitan Water District	125,000
Reclaimed Water[2]	3,000
Total	623,000

Reference: LADWP 1997.

1 Variable quantity up to a maximum of 170,000 acre-ft/yr.
2 Irrigation and industrial uses only.

The Inyo County/Los Angeles Agreement and State Water Resources Control Board Decision 1631 increase the demand for supplemental imported water purchases from Metropolitan. In turn, Metropolitan supplies are subject to constraints that may limit their future availability. Therefore, LADWP seeks to supplement their existing water supplies with additional economical sources. Water from SAMDA's Fremont Valley Ranch will provide 8,000 to 13,000 acre-ft/yr of reliable, economical, dry-year supply.

2.0 DESCRIPTION OF THE PROPOSED ACTION

The proposed project includes pumping groundwater and delivery of the groundwater to the Second Los Angeles Aqueduct where it will supplement LADWP flows. Facilities include four wells, approximately 3.4 miles of well collection pipelines, a pump station with forebay, and a high pressure connection to the aqueduct. Facilities will be sized to deliver from 8,000 to 12,000 acre-feet per year with an anticipated average yield of 10,000 acre-feet per year of groundwater to the aqueduct operating over a ten month period. Figure 2-1 shows the project area and the location of the proposed facilities.

2.1 Proposed Facilities

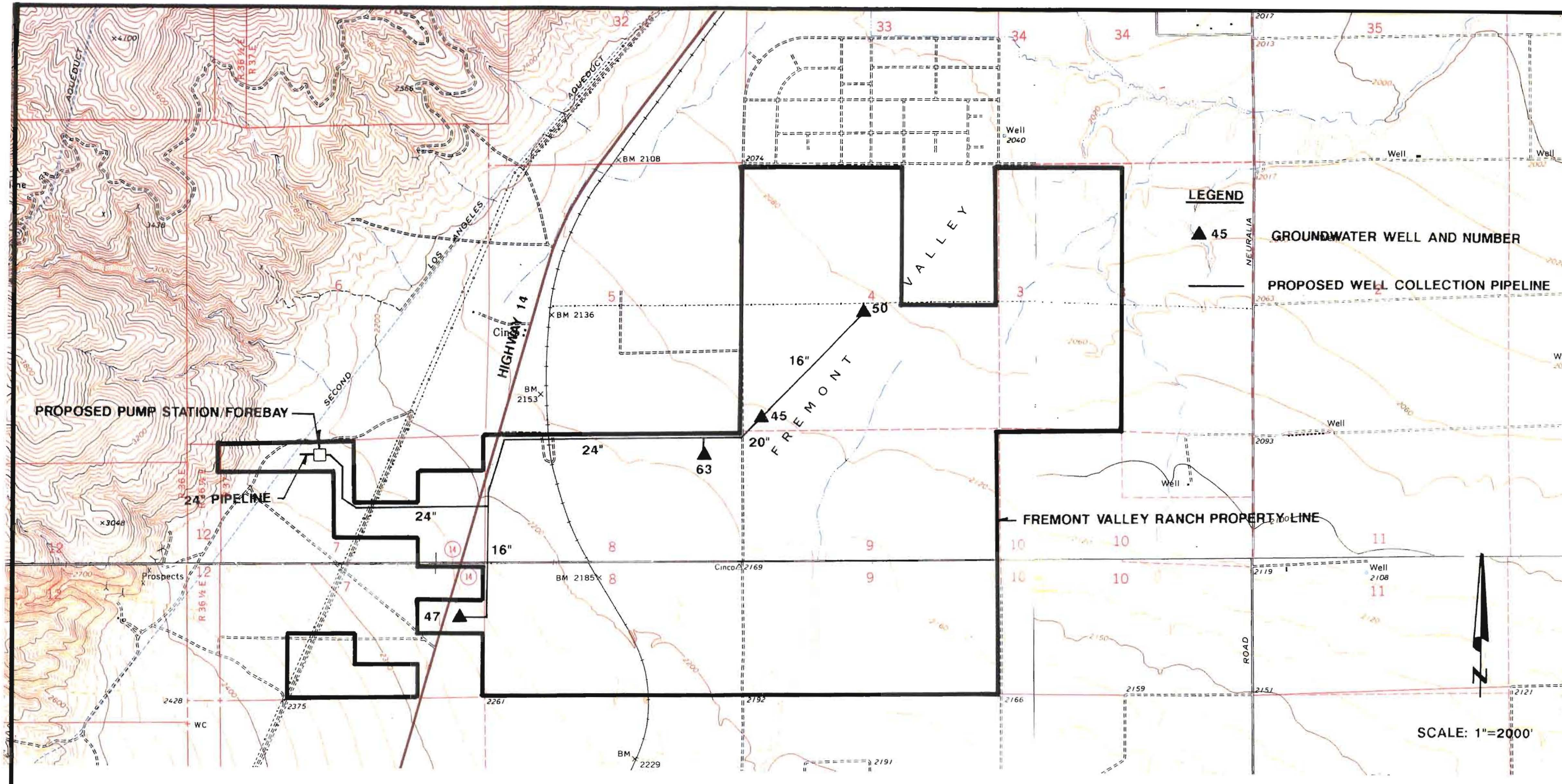
Groundwater will be pumped at four existing wells as shown on Figure 2-1. The existing wells will be redeveloped and new well pumps installed. The maximum anticipated yield of each well is shown in Table 2-1. Each pump is sized in order to pump groundwater to a forebay located at the pump station near the aqueduct. Table 2-1 shows the required head at each of the pumps. Each well site will include a deep well turbine pump, an electrical control panel, and discharge piping. The refurbished facilities will be located in the same location as the previous facilities. The hydraulic requirements for each of the well pumps is listed below:

Table 2-1
Hydraulic Requirements

Well #	Flow Rate (gpm)*	Groundwater Depth (ft)	Change in Elevation (ft)	Friction Losses (ft)	Total Head (ft)
47	**1500**	500	20	12	532
63	**4000**	400	110	14	524
45	**1500**	370	140	15	525
50	**1500**	370	180	25	575

* Based on historical pumping capacity.

The groundwater collection piping system includes approximately 6,000 feet of 16" PVC pipe, 1,400 feet of 20" PVC pipe, and 10,500 feet of 24" PVC pipe. The proposed



FREMONT VALLEY RANCH WATER MANAGEMENT PROJECT
CONCEPTUAL FACILITIES LAYOUT

CLIENT: SAMDA WATER EXPLORATION

PSOMAS

Psomas and Associates
3187 Redhill Avenue, Suite 250
Costa Mesa, California 92626
714/751-7373

Engineers
Surveyors
Planners

Figure 2-1

pipeline alignments are shown on Figure 2-1. A 15 foot wide access road will be constructed to the pump station on the west side of Highway 14 and is proposed to follow the alignment of the 24" pipeline from the frontage road. Pipe will be steel encased from right-of-way to right-of-way when crossing the Southern Pacific Railroad, and when crossing Highway 14.

Groundwater from each well site will be pumped through the collection piping system to a forebay located at the pump station site near the Second Los Angeles Aqueduct. Prior to entering the forebay, a meter will be installed to measure flows. The forebay/booster pumping site is proposed to be located adjacent to the Second Los Angeles Aqueduct right-of-way. The forebay is proposed to be sized at 200,000 gallons, which gives approximately 25 minutes of storage at the design pumping rate. The forebay will essentially be a covered underground concrete storage tank. Flow will be delivered by suction piping to the adjacent booster pumping facility.

The aqueduct has a dynamic pressure of approximately 440 psi at station 4191+12 which is approximately at the proposed point of connection. Flow from the forebay will be boosted to match the pressures in the Second Los Angeles Aqueduct and delivered through high pressure 24" CML&C steel pipe. A high pressure connection facility will transfer flow from the project facilities into the Second Los Angeles Aqueduct. Four or five vertical turbine booster pumps will be used. Booster pump station controls will be installed to provide for remote operation of the pump station and monitor the operating status of the pump station equipment. The booster pump station site includes the forebay, a building to house the pumps, the metering station, and site piping. The site will be fenced, and will require an approximately 1000 foot square area near the aqueduct as shown on Figure 2-1.

The estimated energy requirement of the proposed project is 4600 kilowatt-hours per acre foot of water delivered to the LAA. This equates to a total of 46 million kilowatt hours for 10,000 acre feet of water delivered to the LAA in a typical project year. High efficiency motors are proposed for well pumps and booster pumps to reduce energy consumption.

The project also contributes to hydroelectric power generation. Groundwater delivered to the LAA (along with all other waters conveyed by the LAA) will be used by LADWP to generate hydroelectric power. This generation takes place at the existing LADWP San Francisquito and Foothill hydroelectric power plants.

3.0 ENVIRONMENTAL ANALYSIS

The Los Angeles Department of Water and Power has prepared an Environmental Checklist in compliance with the California Environmental Quality Act (CEQA), to evaluate the potential environmental impacts resulting from the implementation of SAMDA's Fremont Valley Ranch Water Management Project. A full copy of the checklist can be found in Appendix B.

The following analysis addresses the resource areas that are considered less than significant or that can be mitigated to a less than significant level. These include: water resources, air quality, biological resources, utilities and service systems, and cultural resources. The analysis describes the affected environment for these resources, discusses potential project impacts, and identifies project-specific mitigation measures to ensure that all project impacts remain less than significant.

Effects Found Not To Be Significant. The Environmental Checklist determined that most environmental resources would not be affected by the project; therefore, the environmental analysis does not evaluate them beyond the responses included in the checklist. These include: land use and planning, population and housing, geology, transportation and circulation, noise, energy and mineral resources, recreation, aesthetics, public services, and hazards.

3.1 Water Resources

In order to ensure that the proposed project will not result in a significant adverse impact on the water resources of the Fremont Valley, a detailed hydrogeologic analysis was conducted. This study and the Environmental Checklist (Appendix B) prepared by LADWP concluded that potential impacts to water resources would be limited to the projects effects on the quantity and quality of groundwater in the Fremont Valley and vicinity. The hydrogeologic study is presented in its entirety in Appendix A and potential impacts and mitigations are summarized here.

3.1.1 Affected Environment

Fremont Valley is a southwest-northeast trending closed alluvial basin of about 860 square miles. According to Moyle (1969), there are two general lithologic types in the Fremont Valley: (1) consolidated, Tertiary and pre-Tertiary age rocks; and (2) unconsolidated Quaternary-age sediments. The consolidated rocks have low permeabilities and form the mountains that surround the valley area and the basement complex which underlies the unconsolidated sediments (i.e., they form the sides and bottom of the ground-water basin). Groundwater resources are generally contained in the unconsolidated alluvium.

Well logs indicate that porous and permeable sand and gravels were penetrated by every well drilled on the property. Wells completed at locations north of the Cantil fault produced at rates ranging from 2,000 to 4,600 gpm during initial testing. The existing data suggest, but are inconclusive, as to whether separate aquifers may exist at the FVR property. A pump test completed in a deep well onsite showed that the Transmissivity (T) for this well equals 92,619 gpd/ft and Storativity (S) equals 2.42 x 10-3. Specific capacity for the pumping well stabilized at 85.3 gpm/ft after five hours. The water in the deeper aquifer at the FVR property appears to be of good quality, although elevated concentrations of nitrates were detected in a nearby shallow domestic well.

The water table elevation at the FVR property has fluctuated over time as a result of groundwater extraction and annual variations in precipitation. Groundwater flow is toward the southwest corner of Section 4. Previous studies contained estimates of average annual recharge that ranged from 4,200 (exclusive of underflow) to 42,000 acre-feet per year with most estimates indicating average annual precipitation recharge rates between 10,000 and 25,000 acre-feet per year.

The geologic and hydrogeologic conditions, and groundwater pumpage and recharge of the FVR area were evaluated based on data from field investigations and information obtained from state, federal and local agencies as well as from local landowners. Agencies contacted included Kern County Water Agency, California City Planning Department, California Department of Water Resources, California Department of Mines, the U.S. Geological Survey, and the Antelope Valley-East Kern Water Agency. The extent and characteristics of the aquifer and the regional water trends were estimated.

Field investigations were conducted for this site in July and November 1997. July 1997 activities included a site reconnaissance survey, water level measurements, groundwater sample collections and pump testing. November 1997 activities included surface elevation surveying and water level measurement. The results of the field investigation, published geologic maps and hydrogeological data, including current and historical water levels, water quality information and the specific capabilities of wells throughout the Fremont Valley project area were evaluated.

To evaluate whether the water supply wells on the FVR property could produce at a sustained rate of 10,000 acre-feet annually, the amount of groundwater available in excess of current usage was evaluated. It was also recognized that faults and discharge points throughout the Fremont Valley may act to form sub-basins, so that conditions in the valley should be considered by subarea and also as a whole.

The analysis consisted of preparing potentiometric surface maps for 1985 and 1997 data, inputting them into a Geographic Information System (GIS), and using the GIS to calculate the change in saturated volume in total and in smaller subareas. An adjustment was made to account for water spent on irrigation in 1985 and 1986 at farms that are no longer cultivated. The total volume was multiplied by specific yields of 1.0% to 15% to determine a range of values. The overall results show that there is 15,318 to 19,113 acre-feet net excess of water available for extraction in excess of usage for all of Fremont Valley. The amount available for Subarea 5, where the FVR property is located is between 9,455 to 11,871 ac-ft (accounting for irrigation usage in 1985 and 1986). Based on the current water use of less than 11,000 ac-ft these results are fairly consistent with the range of values obtained by previous authors.

3.1.2 Impacts and Mitigation Measures

Given the pumping rates previously observed at the FVR property, it appears reasonable that water could be extracted at a rate up to 10,000 ac-ft in a safe and sustainable manner. At this level of pumping, no adverse impacts to water levels or water quality are anticipated. However, to ensure that the optimum pumping rate will be determined through the use of a groundwater elevation monitoring program to ensure that an overdraft does not occur. The program (described in detail in Appendix) will include the routine collection of water level data and samples from five of the non-pumping wells (#42, 46,48, & 51) on the FVR and the collection of data from wells on adjacent properties and local municipal users. These data will be combined to provide a comprehensive model to continuously monitor water levels and adjust pumping regimes, if necessary.

If remedial action is required to mitigate the effects of a static water table decline, Samda shall contribute to the funding of the action. The amount of contribution will be directly proportional to the amount of water Samda has pumped from the FVR as compared to the total amount pumped from the southwestern Fremont Valley by all groundwater producers over the life of the project.

3.2 Air Quality

3.2.2 Affected Environment

The Fremont Valley Ranch is in the Kern County Air Pollution Control District. The project site is in a federal and state non-attainment area for ozone (O_3). A federal non-attainment area for PM_{10} (dust) exists to the north near Ridgecrest (Paxson 1997).

3.2.3 Impacts and Mitigation Measures

Dust will be generated during the construction phase of the proposed project. These impacts are not expected to exceed air quality standards. However, the project will incorporate measures to ensure that dust levels remain below significant levels. The proponent will comply with standard construction practices (watering of construction sites and access roads) for the control of fugitive dust. The project is not expected to contribute significantly to ozone levels or result in any new violations of the O_3 ambient standard. Therefore, the project will not result in any significant impacts to local or regional air quality.

3.3 Biological Resources

3.3.1 Affected Environment

The project area is in the Mojave Desert Bioregion. Part of the project area is on undisturbed desert shrublands. Because of the potential of the site to support federal- and state-listed species, particularly the desert tortoise, a Biological Assessment was prepared in compliance with Section 7 of the Endangered Species Act of 1973 (as amended). The Biological Assessment is attached as Appendix C and summarized below.

Psomas and Associates conducted reconnaissance-level biological surveys along the entire pipeline alignment to characterize and document existing conditions and evaluate the potential of the habitat to support special status species. Wildlife surveys were conducted by Brian Leatherman concurrently with focused desert tortoise surveys as described in detail below. Scott White conducted the botanical survey on 20 October 1997. All plant and wildlife species encountered during the surveys were recorded on standardized data sheets. Prior to the surveys, the most recent records of the California Natural Diversity Database and the California Native Plant Society's Electronic Inventory of Rare and Endangered Vascular Plants of California (CNPSEI 1997) were reviewed to identify the potential presence of special status species.

A focused desert tortoise survey was completed in all suitable habitat (i.e., west of Highway 14 and in undisturbed habitat adjacent to the pipeline alignment east of the highway), following the most current recommendations of the US Fish and Wildlife Service (1992). The survey used parallel belt transects 30 feet wide, providing 100-percent coverage of the survey area. Additional "zone of influence" surveys were completed at 100, 300, 600, 1,200 and 2,400 feet from and parallel to the project boundary. All diagnostic sign of desert tortoise (e. g., live tortoises, carcasses, scat, burrows, tracks, eggshell fragments, pallets, drinking depressions, courtship rings) was recorded on standardized data sheets and mapped. A mirror was used to reflect sunlight into burrows to determine if tortoises were present. No tortoises were handled or marked. All wildlife encountered during the surveys were documented.

Vegetation

West of the Highway, creosote bush scrub is the dominant vegetation type/wildlife habitat that occurs along the proposed alignment. It is characterized by moderately widely spaced shrubs dominated by creosote bush (*Larrea tridentata*), white-bursage (*Ambrosia dumosa*) and desert senna (*Senna armata*). Other species occurring in lower densities include box thorn (*Lycium andersonii*), allscale (*Atriplex polycarpa*), and Russian thistle (*Salsola tragus*). The latter two species were more common on the east side of Highway 14 in the disturbed areas of the fallow agricultural fields. Red-stemmed filaree (*Erodium cicutarium*) and grasses (*Schismus* sp.) were common around the base of most shrubs. Mojave wash scrub occurs in a few washes crossing the undisturbed creosote bush scrub.

The alignment route east of Highway 14 likely supported creosote bush scrub prior to its conversion to agriculture. A remnant patch of creosote bush scrub occurs adjacent to the fallow fields. Vegetation on the fallow fields can be described as incipient desert saltbush scrub; allscale is colonizing the area, and Russian thistle and jimsonweed are common, but for the most part individuals are widely scattered.

Wildlife

Because of the limited extent of the proposed project, dominance of only one vegetation community, and timing and nature of the survey, few wildlife species were detected. Emphasis was placed on evaluating the potential of the habitat to support endangered, threatened or other special status species. Common species observed or detected include side-blotched lizard (*Uta stansburiana*), red-tailed hawk (*Buteo jamaicensis*), sage sparrow (*Amphispiza belli*), common raven (*Corvus corax*), black-tailed jackrabbit (*Lepus californicus*) and coyote (*Canis latrans*).

In addition to these common species, several special status species have been observed or potentially occur within the vicinity of the project site. Species currently listed are discussed below, and all special status species known from the area are addressed in the Biological Assessment (Appendix C, Table 1).

Special Status Species

Desert Tortoise. Desert tortoises evidently occur on the project site west of the highway, and have historically occurred east of the highway. Old desert tortoise sign (one old scat and one burrow, possibly once used by a tortoise, but now completely collapsed) were noted east of the highway. No recent sign was observed in this area. Creosote bush scrub on the east side of Highway 14 is isolated on all sides from adjacent blocks of extensive habitat (by the road and by former agricultural lands), and human disturbance is high. Thus, it is unlikely that the area continues to support a desert tortoise population.

Habitat west of Highway 14 is relatively undisturbed, although several dirt roads, OHV trails, dump sites, and camps occur. Five inactive desert tortoise burrows (of varying quality) and 3 burrows of unknown animals were observed. In addition, two desert tortoise carcasses were observed. No live tortoises were encountered along the alignment or zone of influence surveys. Locations of recent desert tortoise sign and a summary of all of observed tortoise sign are presented in the Biological Assessment (Appendix C, Figure 2 and Table 2, respectively).

Mohave Ground Squirrel. The Mohave ground squirrel occurs in open areas in a variety of desert habitats in the western Mojave desert which lies in portions of Inyo, Kern, San Bernardino, and Los Angeles counties. It seems to prefer large alluvial-filled valleys with deep, fine- to medium-textured soils vegetated with creosote bush scrub, shadscale scrub, or alkali sink scrub, and it has been found in areas with previous ground disturbance. Determination of suitable or occupied habitat is difficult. Habitat conditions do not remain geographically constant, evidently due to uneven rainfall patterns. Populations in some areas may be declining while in others may be expanding. Based on these factors, all lands within the range of the squirrel are generally considered Mohave ground squirrel habitat. Records of Mohave ground squirrel exist for the project region and they are assumed to be present on or in the vicinity of the project area.

The Department of Fish and Game has used a Cumulative Human Impact Evaluation Format (CHIEF) to rank the quality of habitat. These guidelines are no longer used to determine compensible habitat and compensation ratios, but some of the criteria are useful to describe the level of human-related disturbance. This information, coupled with a discussion of the abiotic and other factors relative to the project site, and a detailed description of the habitat, is used to identify relative habitat quality and assign compensation ratios.

The portion of the project site on the east side of Highway 14 comprises fallow agricultural lands and no native habitat would be disturbed during construction. An investigation of this area did not reveal any rodent burrows or other signs of wildlife except at the borders where adjacent areas support creosote bush scrub.

Although the habitat on the west side of highway 14 is relatively intact, there are several reasons that it may not be considered an area critical to the conservation of the Mohave ground squirrel. These reasons are listed below:

- Habitat, even in undisturbed parts of the alignment, is only marginally suitable due to soil conditions.
- It is isolated by mountains to the west and by Highway 14 to the east.
- No suitable habitat occurs across the highway, so there is unlikely to be a "source" population to emigrate onto the site.
- Tortoise fencing prevents movement across the Highway, even if a source population were to occur there.
- The site is located at the extreme western edge of the species' range.

Waters of the United States

Several minor drainageways cross the proposed pipeline route. One of these is east of the highway, in disused agricultural lands. The others are on the alluvial fan below the mountain foothills west of the highway. None of these drainageways supports wetlands or aquatic resources, but they meet jurisdictional criteria as Waters of the United States (under Section 404 of the Federal Clean Water Act) and as streambeds (under Section 1603 of the California Fish and Game Code). Impacts to these drainageways will not be significant in terms of biological or hydrologic resources, but will require permitting through applicable statute, administered by the U.S. Army Corps of Engineers and California Department of Fish and Game.

3.3.2 Impacts and Mitigation Measures

Potential project impacts include temporary construction disturbance, longer term habitat recovery, and permanent loss of some habitat (due to the permanent access road along the pipeline route and the permanent forebay and pump station).

Temporary construction disturbance would occur on about 1.0 acre of suitable desert tortoise habitat along the alignment during pipeline construction. Spoil/stockpile areas and extra staging areas for road and railroad crossing will be located in previously disturbed areas. Permanent habitat loss associated with the road along the alignment and the fenced area is approximately 1.2 acres.

The desert tortoise could be affected by construction activities. Specific impacts by construction potentially include loss or displacement of individuals, disturbance to burrows, and removal and/or disturbance to vegetation comprising tortoise habitat. Specific construction best management practices and mitigation measures will include:

- Construction personnel will be trained to recognize and avoid desert tortoises.
- Firearms, pets and camping shall be prohibited at the construction site.
- Trash will be managed to avoid attracting coyotes or ravens.
- The construction site will be surveyed for desert tortoises in advance of beginning work; burrows that may occur within the area and cannot be avoided by construction will be excavated or collapsed by qualified biologists following agency protocols. If tortoises must be moved, handling shall follow the Guidelines for Handling Desert Tortoises During Construction Projects [Desert Tortoise Council 1994 (Revised 1996)].
- Tortoises excavated from unavoidable burrows along the alignment shall be relocated to unoccupied natural or artificially constructed burrows immediately following excavation.
- A qualified tortoise biologist/compliance monitor shall be present during construction to inspect the site daily and remove tortoises from the construction zone if needed.
- Disturbed areas shall be revegetated with native species to accelerate recovery of the habitat.
- Vehicle access and speed will be tightly controlled.

In order to mitigate impacts to marginally suitable Mohave ground squirrel habitat, compensatory habitat will be provided. The acres of habitat to be compensated would depend on the actual amount of surface disturbance resulting from the proposed project and the pre-existing habitat quality. Compensation would be at a ratio of 1:1 or 2:1 based on pre-project habitat quality as described in Section 4.2 of the Biological Assessment. Habitat east of Highway 14 would be compensated at 1:1 (one acre of compensation land for each acre disturbed). Habitat west of Highway 14 would be compensated at 2:1.

3.4 Utilities

The project will not result in a need for new systems or supplies, or substantial alterations to utilities with the possible exception of local and regional water supplies. Therefore this discussion is limited to the potential impacts of the project on water supplies. A more detailed discussion of water resources is provided in Section 3.1.

3.4.1 Affected Environment

The overall of hydrogeological studies (see Section 3.1 and Appendix A) show that there is 15,318 to 19,113 acre-feet net excess of water available for extraction in excess of usage for all of Fremont Valley. The amount available for Subarea 5, where the FVR property is located is between 9,455 to 11,871 acre-ft (accounting for irrigation usage in 1985 and 1986).

3.4.2 Impacts and Mitigation Measures

No adverse impacts to local or regional water supplies are anticipated. However, project implementation includes a monitoring program to ensure that any impacts remain below a level of significance. The monitoring program is summarized in Section 3.1.2 and described in detail in Appendix A.

3.5 Cultural Resources

A cultural resources survey of the project site was conducted by archaeologists and paleontologists from Brain Smith and Associates on October 6, 1997. Institutional record searches were conducted by the Southern San Joaquin Valley Archaeological Information Center. One cultural resource was identified on the project as a result of the field survey. The proposed pipeline alignment from Well 50 was subsequently changed and now avoids this site. The record searches also identified two linear sites within the project areas (the Southern Pacific Railroad and the Los Angeles Aqueduct), which were re-identified during the current survey. Fifteen archaeological sites are recorded within a one-mile radius of the project area. Results of the cultural resources investigations are detailed in Appendix D and summarized here.

3.5.1 Affected Environment

Archaeological Survey Results. The archaeological reconnaissance resulted in the recording of a single previously undiscovered historic site, FVP-1. This small scatter of historic and recent debris was located in the northeastern portion of the project near Well 50. The site measures 60 feet (18 meters) east to west by 40 feet (12 meters) north to south. The site contained more than twenty pieces of purple (solarized) glass, approximately 20 pieces of aqua glass, and more than15 pieces of brown glass. Ten pieces of porcelain (no pattern) were also noted. Over 30 pieces of unidentifiable metal, some of which appeared to be recent additions, were also present, as were other recently discarded items such as approximately 15 round nails and one glove. The site is located along a faint trail beneath power lines servicing Well 50; a more traveled road parallels the power lines less than 30 feet to the north. Subsequent to the field survey, the proposed pipeline alignment from Well was adjusted. Although a small portion of the new alignment is in an area which was not covered in the ground survey, it crosses recently cultivated land similar and adjacent to surveyed sections which yielded no surface evidence of cultural resources.

Both the Los Angeles Aqueduct and the Southern Pacific Rail Line, which were previously recorded as historic sites, were encountered during the survey.

Paleontological Survey Results. The project site was also investigated for potential paleontological (fossil) resources. A ground survey on either side of the proposed pipeline right-of-way did not reveal any fossils or sedimentary exposures that might yield any fossils. A few scattered mammal bones found on the surface were all modern. Geologically, the site is located on alluvium and colluvial materials derived from the adjacent hills to the west, on the western upthrown side of the Garlock Fault. The rocks uplifted by the fault are predominantly "granitic" (quartz monzonite) plutonic rocks (see geologic map of Dibblee, 1967: Plate 1, west half), which are never fossiliferous. The material that covers the surface represents Holocene (modern) and Pleistocene sands and gravels washed down steep canyons and redeposited on alluvial fans and outwash surfaces. Although an eroded fault scarp (Clark 1973 [1974]: Sheet 2, Section D) is located near the midpoint of the dividing line between Sections 8 and 9, no bedrock exposures are present, along this scarp. The Pliocene Ricardo Formation has yielded vertebrate fossil remains in other areas. Limited areal exposures of the Ricardo Formation are present approximately one mile to the north of the project site, but drainage from the exposure is to the east, away from the project site.

Given the alluvial/colluvial nature of the exposed sediments within the project site, their probable occurrence to some depth in the fault graben, and the distance from any potentially fossiliferous formations, it is highly unlikely that any fossils would be found in these sediments. The project area is thus regarded as lacking any potential paleontological resources.

Results of the Record Searches. Archaeological record searches for the Fremont Valley Pipeline Project were performed by the Southern San Joaquin Valley Archaeological Information Center (Confidential Appendix). Two cultural resources have been registered for the Fremont Valley Pipeline Project area, both historic sites. The first is the Southern Pacific Railroad Grade (CA-KER-3366-H and CA-INY-4607-H), which runs through the center of the project. This segment of the Southern Pacific line runs from Mojave Station to Searles Junction, and was constructed in 1908. The second site, CA-KER-3549-H, is the Second Los Angeles Aqueduct, which lies at the extreme western edge of the project. The first phase was built between 1908 and 1913, with a second phase begun in 1967.

A total of 15 sites have been recorded within one mile of the project. Fourteen of these cultural resources have been identified as isolates in the record search. A prehistoric/historic site, CA-KER-2142/H, is situated less than a mile south of the westernmost portion of the project area. This site has been described as two areas of discolored soil with prehistoric artifact concentrations, including hammer stones, a biface fragment, and two obsidian stemmed corner notched projectile points, within a scatter of cryptocrystalline debitage and tools. Features include two historic or recent rock hearths with associated historic can and bottle debris. Within one and a half miles, an additional two prehistoric sites have been recorded, including one milling station and one sparse lithic scatter. These sites characterize the past prehistoric and historic use of the area, albeit somewhat infrequent and localized.

No previous studies have been performed specifically within the study area. Five studies (Applied Conservation Tech 1985; McManus 1987; Uli 1984; Schiffman 1985, and 1987) have been located within one mile of the study area, however, and two of these recorded other segments of the Los Angeles and the Southern Pacific Railroad, both of which cross the subject property. No other previous archaeological study is recorded for the subject property.

3.5.2 Impacts and Mitigation Measures.

The proposed project has the potential to affect three cultural resources. These are the Los Angeles Aqueduct (CA-KER-3549-H), the rail line (CA-KER-3366-H and CA-INY-4607-H), and the historic scatter (FVP-1). The connection of the pipeline from the Fremont Valley Ranch wells into the Los Angeles will not compromise any historic elements or conditions that are the basis for the historic significance of this water delivery system. The connection is not an adverse impact to the historic sensitivity of the aqueduct.

Impacts to the rail line will be avoided by boring the water pipeline beneath the track bed. The boring process will not have any effect on the existing condition of the railroad or on the historic characteristics of the resources.

Impacts to the historic scatter at FVP-1 could be adverse, although this site has not been evaluated as significant. The flexibility provided to the project engineers to locate the pipeline where most advantageous, considering environmental, engineering, and land form aspects of the project, will allow the placement of the alignment from Well 50 in an area which avoids the historic site.

Subsequent to the field surveys, the proposed pipeline alignment from well #50 was changed slightly (Figure 2-1). A portion of the new alignment is outside the area surveyed for cultural resources. However, the new alignment crosses an area which has been intensively cultivated and the only newly documented site (FVP-1) encountered during the field survey is believed to have been associated with a former half-section line road. Nevertheless, an archaeological monitor will be present during the construction along the new alignment.

No impacts to paleontological resources are anticipated by the construction of this project. No such resources are reported for the site area, and no indications of fossils were observed on the project site during the survey.

3.6 Cumulative Impacts

Known projects in the vicinity of the Fremont Valley Ranch, either in progress or planning stages have been identified. The impacts of extended drought, would have cumulative impacts, and were evaluated using a numerical groundwater model (see Appendix A). These stresses were simulated in the model to evaluate the effect on shallow water levels and the impacts on spring flow independent of each other and in concert. To ensure that there are no negative effects to the aquifer's water table which could result in impacts to future projects, a monitoring program has been developed. This program will include routine measurements at non-pumping wells on the FVR and collection of data on groundwater and subsidence from adjacent properties and local municipal water users. If potential impacts are identified, the pumping regime will be modified and/or remedial action undertaken to ensure that effects to the aquifer do not result in significant cumulative impacts.

3.7 Mandatory Findings of Significance

The project could cause significant impacts to groundwater resources, but these impacts will be avoided by the implementation of monitoring and mitigation measures described in this report and in Appendix A. The project would result in permanent loss of habitat for desert tortoise and Mohave ground squirrel, but these impacts would be reduced below a level of significance by mitigation measures described in this report. Potentially significant historical resources occur near the project site, but these resources will be avoided by the pipeline realignment and the presence of an on-site monitor during construction.

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APPENDIX A HYDROGEOLOGIC REPORT

APPENDIX B ENVIRONMENTAL CHECKLIST

APPENDIX C BIOLOGICAL ASSESSMENT

APPENDIX D CULTURAL RESOURCES REPORT

APPENDIX A

HYDROGEOLOGIC ASSESSMENT OF FREMONT VALLEY

Prepared for:

SAMDA, INC.

December 1, 1997

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EXECUTIVE SUMMARY

This report presents Earth Satellite Corporation's (EarthSat's) assessment of the hydrogeologic conditions at the Fremont Valley Ranch (FVR) property in Kern County, California. This work was performed on behalf of Samda, Inc. of Santa Monica, California to evaluate the impacts of pumping 10,000 acre feet annually from the FVR; specifically, addresses whether water supply wells on this property could produce at an annual rate of up to 10,000 acre-feet, and whether the annual basin recharge could support this rate of extraction. Our evaluation is based on publicly-available information, private reports prepared by consultants for other parties, drilling logs, Landsat Thematic Mapper (TM) imagery, site visits, and aquifer testing.

The FVR property consists of 2,312 acres located in the western portion of the Mojave Desert, about 20 miles north of Mojave, California. The site is surrounded by abandoned farming operations and desert.

Fremont Valley is a southwest-northeast trending closed alluvial basin of about 860 square miles. According to Moyle (1969), there are two general lithologic types in the Fremont Valley: (1) consolidated, Tertiary and pre-Tertiary age rocks; and (2) unconsolidated Quaternary-age sediments. The consolidated rocks have low permeabilities and form the mountains that surround the valley area and the basement complex which underlies the unconsolidated sediments (i.e., they form the sides and bottom of the ground-water basin). Groundwater resources are generally contained in the unconsolidated alluvium.

Well logs indicate that porous and permeable sand and gravels were penetrated by every well drilled on the property. Wells completed at locations north of the Cantil fault produced at rates ranging from 2,000 to 4,600 gpm during initial testing. The existing data suggest, but are inconclusive, as to whether separate aquifers may exist at the FVR property. A pump test completed in a deep well onsite showed that the transmissivity (T) for this well equals 92,619 gpd/ft and Storativity (S) equals 2.42×10^{-3}. Specific capacity for the pumping well stabilized at 85.3 gpm/ft after five hours. The water in the deeper aquifer at the FVR property appears to be of good quality, although elevated concentrations of nitrates were detected in a nearby shallow domestic well.

The water table elevation at the FVR property has fluctuated over time as a result of groundwater extraction and annual variations in precipitation. Groundwater flow is toward the southwest corner of Section 4. Previous studies contained estimates of average annual recharge that ranged from 4,200 (exclusive of underflow) to 42,000 ac-ft per year with most estimates indicating average annual precipitation recharge rates between 10,000 and 25,000 ac-ft per year.

The geologic and hydrogeologic conditions, and groundwater pumpage and recharge of the FVR area were evaluated based on data from field investigations and information obtained from state, federal and local agencies as well as from local landowners. Agencies contacted included Kern County Water Agency, California City Planning Department, California Department of Water Resources, California Department of Mines, the U.S. Geological Survey, and the Antelope Valley-East Kern Water Agency. The extent and characteristics of the aquifer and the regional water trends were estimated.

Field investigations were conducted for this site in July and November 1997. July 1997 activities included a site reconnaissance survey, water level measurements, groundwater sample collections and pump testing. November 1997 activities included surface elevation surveying and water level measurement. The results of the field investigation, published geologic maps and hydrogeological data, including current and historical water levels, water quality information and the specific capabilities of wells throughout the Fremont Valley project area were evaluated.

To evaluate whether the water supply wells on the FVR property could produce at a sustained rate of 10,000 ac-ft annually, we evaluated the amount of groundwater available in excess of current usage, recognizing that it is preferable to rely on real data, and to limit the use of assumptions when possible. We also recognized that faults and discharge points throughout the Fremont Valley may act to form sub-basins, so that conditions in the valley should be considered by subarea and also as a whole.

Our approach consisted of preparing potentiometric surface maps for 1985 and 1997 data, inputting them into a GIS system, and using GIS to calculate the change in saturated volume in total and in smaller subareas. An adjustment was made to account for water spent on irrigation in 1985 and 1986 at farms that are no longer cultivated. The total volume was multiplied by specific yields of 11% to 15% to determine a range of values. The overall results, summarized in Table E-1, are that there is 15,318 to 19,113 ac-ft net excess of water available for extraction in excess of usage for all of Fremont Valley. The amount available for Subarea 5, where the FVR property is located is between 9,455 to 11,871 ac-ft (accounting for irrigation usage in 1985 and 1986). Based on the current water use of less than 11,000 ac-ft these results are fairly consistent with the range of values obtained by previous authors.

Given these results and the pumping rates previously observed in the Fremont Valley, it appears reasonable that water could be extracted at a rate up to 10,000 ac-ft/year in a safe and sustainable manner. The optimum rate should be determined through the use of a groundwater elevation monitoring program to ensure that an overdraft does not occur. The monitoring program outlined at the end of this report will account for periodic fluctuations in the water table due to variations in precipitation, and establish criteria that take this into consideration.

Table E-1. Results of Recharge Analysis

Sub-Area	Area		Total Change in Saturated Volume (ac-ft)	Total Change in Water Level (ft)	Annual Change in Water Level (ft/yr)	Annual Volume of Water Available in Excess of Usage (ac-ft/yr)		Annual Recharge in Excess of Usage (ac-ft/yr)
	(acres)	(mi^2)				Sy = 0.11	Sy = 0.15	n = 0.20
1	98145	153.4	-34683	-0.35	-0.03	-317.93	-433.54	-578.05
2	65897	103.0	115816	1.76	0.15	1061.65	1447.70	1930.27
3	27035	42.2	381315	14.10	1.18	3495.39	4766.44	6355.26
						[a] 5568.99	[a] 6840.04	[a] 8428.85
4	43833	68.5	6208	0.14	0.01	56.90	77.60	103.46
5	13990	21.9	724863	51.81	4.32	6644.58	9060.79	12081.05
						[a] 9455.28	[a] 11871.49	[a] 14891.00
6	17135	26.8	-109466	-6.39	-0.53	-1003.44	-1368.33	-1824.44
7	12103	18.9	54239	4.48	0.37	497.19	677.99	903.99
Total	**278138**	**434.5**	**1138292**	**65.55**	**5.46**	**10434.30**	**14228.70**	**18971.50**
Total[a]	**278138**	**434.5**	**1138292**	**65.55**	**5.46**	**15318.65**	**19112.95**	**23855.84**

Key: Sy = specific yield, n = porosity, ac-ft = acre feet

a Values include water usage in 1985 and 1986 by farms that are no longer in operation.

1.0 INTRODUCTION

This report presents Earth Satellite Corporation's (EarthSat's) assessment of the hydrogeologic conditions at the Fremont Valley Ranch (FVR) property in Kern County, California. This work was performed on behalf of Samda, Inc. of Santa Monica, California to evaluate whether water supply wells on this property could produce at an annual rate of up to 10,000 ac-ft, and whether the annual basin recharge could support this rate of extraction. Our evaluation is based on publicly-available information, private reports prepared by consultants for other parties, drilling logs, Landsat Thematic Mapper (TM) imagery, site visits, and aquifer testing.

1.1 SCOPE OF WORK

The hydrogeological analysis included the tasks listed below:

- Collecting and evaluating geologic and hydrogeological data provided by Samda that was obtained from local landowners, federal, state and local agencies. Agencies contacted included the California City Planning Department, the Kern County Water Agency, the Kern County Planning Department, Antelope Valley-East Kern Water Agency (AVEK), California Department of Water Resources (DWR), California Department of Resources (CDR), California Department of Mines and Geology (DMG), U.S. Geological Survey (USGS) and the Lahontan Regional Water Quality Control Board.

- Estimating the characteristics of the aquifers in which Samda production wells are completed.

- Evaluating regional water level trends and water quality data obtained from wells in the southern Fremont Valley.

- Measuring water levels in Samda wells.

- Performing a 24-hour constant-discharge aquifer test of Production Well 63 to better estimate aquifer hydraulic parameters in the area.

- Evaluating the potential effects of the proposed increased pumpage due to the Samda project on vegetation in southern Fremont Valley.

- Digitizing the valley floor and drainage basin extent, and using a Geographic Information System (GIS) to measure the size of these areas.

- Preparing geologic cross sections of the FVR.

- Evaluating water usage per year between 1985 and 1997 based on imagery analysis and discussions with local residents.

- Preparing hydrographs from the 1950's to 1997 for wells monitored annually by the USGS between 1985 and 1997.

- Comparing trends shown in the hydrographs with well location, nearby pumping, and annual precipitation.

- Identifying "subareas" of the study area based on differing water levels across faults, discharge points, and response to pumping.

- Evaluating the changes in the potentiometric surface across Fremont Valley between 1917 and 1997.

- Using a Geographic Information System (GIS) to calculate changes in groundwater storage between 1985 and 1997.

- Comparing the GIS results with estimated extraction rates to evaluate annual recharge in excess of extraction.

1.2 BACKGROUND

The FVR property consists of 2,312 acres located in the western portion of the Mojave Desert, about 20 miles north of Mojave, California (Figures 1-1). The site is bordered by abandoned farming operations to the north and east, and desert land to the south and west. United States Geologic Survey (USGS) topographic maps indicate that ground surface elevation at the ranch varies between 2280 and 2020 feet above mean sea level (msl), with the higher elevations south of the scarp formed by the Cantil fault. Three ephemeral streams cross the property; each flows toward the northeast. Highway 14, the Southern Pacific railroad tracks, the second LADWP Aqueduct and LADWP high-tension power lines traverse the western portion of the property. A house and several farm-related ancillary buildings are onsite. Fourteen shallow wells (less than 1,000 feet), one deep well (1,794 feet), and an empty bermed reservoir are also located on the property.

The onsite wells were drilled between 1952 and 1981, when 2179 acres of this property was converted from desert land to agriculture (alfalfa farming). Between 1973 and 1986, the onsite wells reportedly produced between 12,000 and 17,000 ac-ft of water per year, and a cumulative annual amount of up to 60,000 ac-ft per year was extracted throughout the Fremont Valley for farming and other purposes. As a result, the regional water table dropped between 100 and 300 feet. Farming was discontinued at the FVR property and at most of the other ranches in the Fremont Valley in the mid 1980's. Since that time, the water levels at the FVR property have risen about 5 to 7 feet per year (see hydrographs in Appendix D).

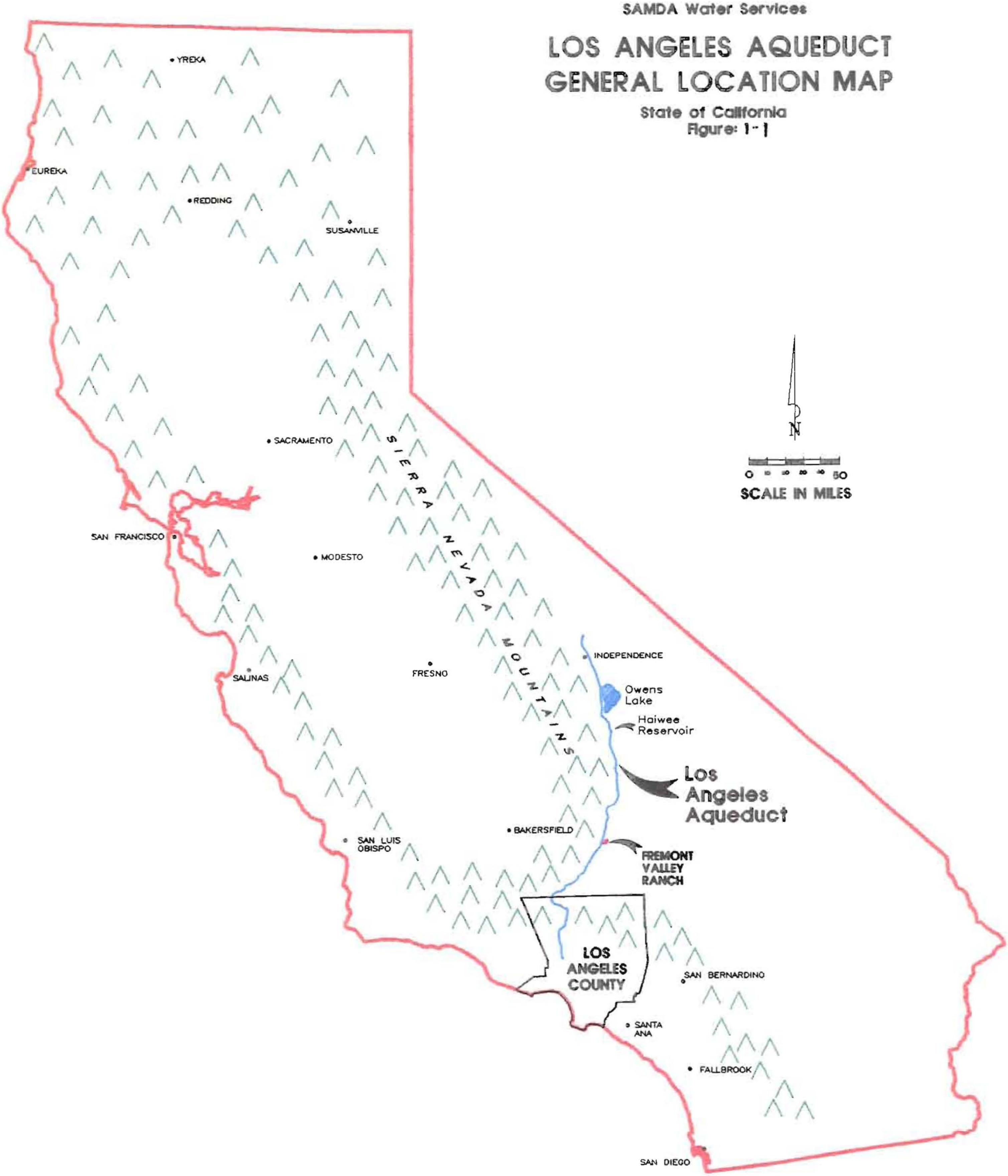
According to Psomas (1997), natural vegetation in the Fremont Valley includes the Creosote Brush Scrub vegetation community. Common perennial species include creosote brush, Mormon Tea, burro brush, and black brush. Salt Cedar and mesquite trees, both phreatophytes, grow near the edges of the playa and at spring locations. Perennial vegetation cover is less than 25% in the undisturbed areas.

The remainder of this report focuses on the factors that could affect the productivity of the planned groundwater extraction project. Section 2 summarizes the geologic and hydrogeologic characteristics of the study area and Section 3 presents a list of the references cited. Supporting information is provided in Appendices. Appendix A presents boring logs from the study area; Appendix B provides sections from certain referenced reports; Appendix C contains a summary of the methodology and results of the pump test; Appendix D contains groundwater elevation measurements, graphs of precipitation rates, and hydrographs; Appendix E contains geologic cross sections; Appendix F contains maps of the study area and subareas and potentiometric surfaces in 1985 and 1997; and Appendix G contains copies of Satellite imagery.

SAMDA Water Services

LOS ANGELES AQUEDUCT GENERAL LOCATION MAP

State of California
Figure: 1-1



2.0 GEOLOGIC AND HYDROGEOLOGIC SETTING

This section presents information on the geologic setting and the hydrogeologic characteristics of the FVR property. A thorough understanding of the geology is necessary to evaluate the water-bearing properties of the subsurface. The hydrogeologic section provides information on aquifer properties, water quality, recharge, and water usage.

2.1 REGIONAL GEOLOGY

Fremont Valley is a southwest-northeast trending closed alluvial basin of about 860 square miles (Moyle, 1969). It is bounded by the El Paso mountains to the north, the Rand Mountains to the east, an alluvial high to the south, and the Sierra Nevada Mountains to the west. Geographically, the area consists mainly of alluvial fans and plains built out from the mountains. The valley floor consists of about 434 square miles.

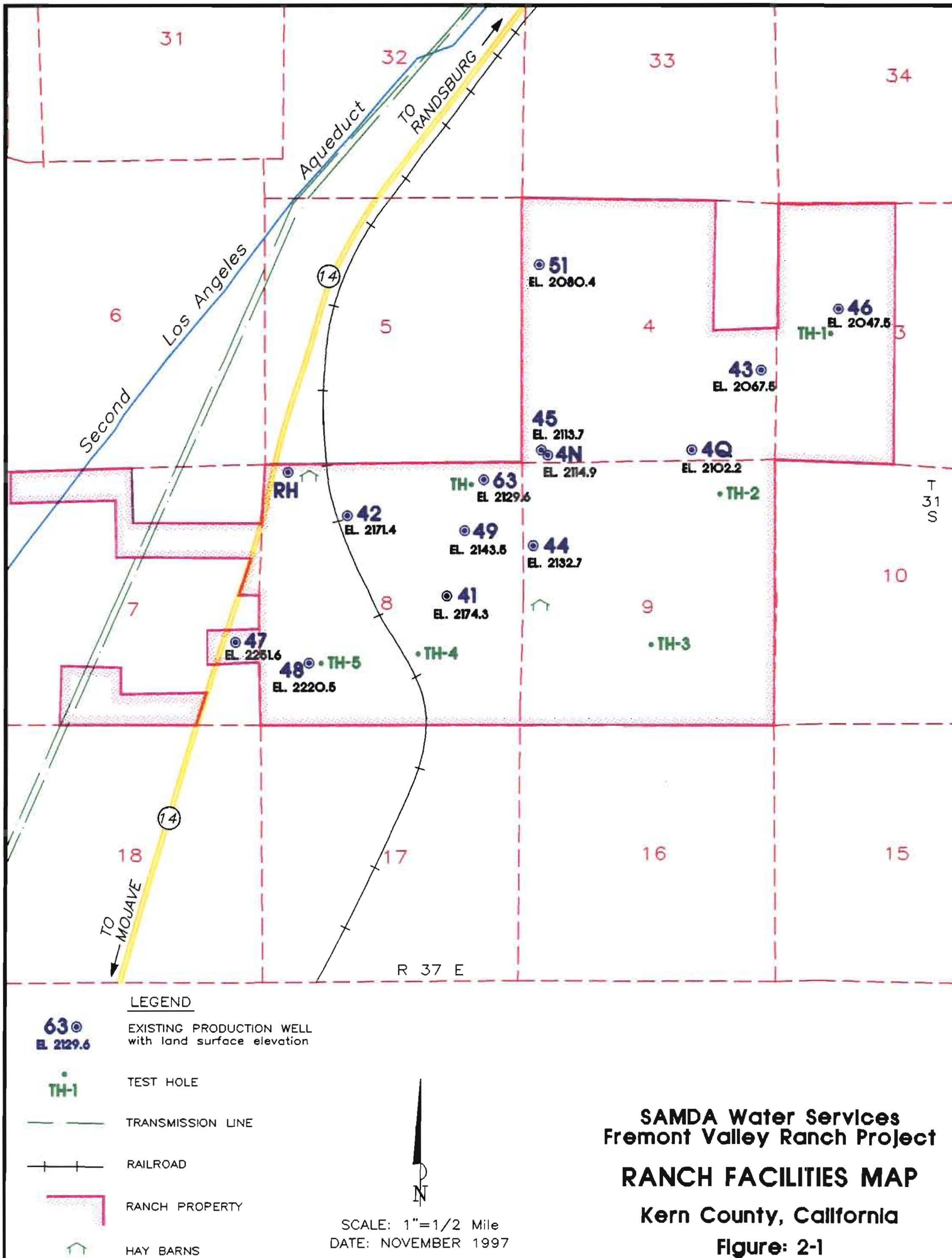
According to Moyle (1969), there are two general lithologic types in the Fremont Valley: (1) consolidated, Tertiary and pre-Tertiary age rocks; and (2) unconsolidated Quaternary-age sediments. The consolidated rocks have low permeabilities and form the mountains that surround the valley area and the basement complex which underlies the unconsolidated sediments (i.e., they form the sides and bottom of the ground-water basin). Although the consolidated rocks are relatively impermeable, they are important in that they underlie the mountainous areas that receive the major part of the precipitation within the drainage basin, and the runoff from these areas forms a major contribution to the recharge in the alluvium.

The oldest formation in the area, the basement complex of pre-Tertiary age, consists of igneous and metamorphic rocks. The basement complex is generally impermeable, except for joints and weathered zones that yield small quantities of water to springs. Joints and faults in the basement complex may constitute channeling for groundwater movement from the mountains to Fremont Valley.

Most of the groundwater supplies in this basin lie within the unconsolidated sediments. Table 2-1 summarizes the general distribution and characteristics of the lithologic units within the unconsolidated sediments. The unconsolidated sediments in the Fremont Valley consist of alluvial fan, lacustrine, playa, and windblown sand deposits. Smith's 1964 map of the surficial geology indicates that most of the FVR property has Recent (Holocene) alluvium at the surface, except Section 3 and portions of Section 4 which have a veneer of lake (playa) deposits. This interpretation is consistent with boring logs that show that a clay layer up to 200 feet thick is present at the ground surface in these sections.

Boring logs are available from 18 of the 20 wells and test boreholes drilled at this property (Appendix A). Current wells are shown on the site plan (Figure 2-1). These boring logs were reviewed to evaluate whether an obvious confining layer was present and to assess the continuity of the aquifer. These data indicate that the subsurface lithology varies with depth and location throughout the property. In general, there are several sequences of coarse sand and gravel. Clayey sand or clay layers are interbedded with the coarse sediments in several of the boreholes. The clays are often described as blue or brown in color. Clay thicknesses in localized areas are up to 200 feet thick. The presence of thick localized clay beds suggests that small playas may have formerly been present at the property. The location of these playas apparently shifted over time; however, the northeastern portion of the property generally contains more clayey sediments than the rest of the FVR. This is illustrated by the cross sections in Appendix E.

Eight of the boring logs indicated cemented sand or "hard sand" at various depths between 1,200 and 1,400 feet above mean sea level (amsl) (Table 2-2). As a result, all but one of the onsite wells are completed above 950 feet. Based on this description and its stratigraphic position this "hard



SAMDA Water Services
Fremont Valley Ranch Project

RANCH FACILITIES MAP

Kern County, California

Figure: 2-1

sand" may represent the Pleistocene-age alluvium which is characterized by local cementation, and considered to be an important water bearing zone in this area (Moyle, 1969).

Table 2.1. Description of Quaternary Sediments[1]

Type of Deposit	Description	Flow Characteristics	Location/Pattern
Holocene			
Fan deposits	Mostly poorly sorted gravel, sand, and silt, and mudflows derived from nearby hills or mountains. [2]	Poorly permeable yield little water to wells.	Usually above the water table.
Alluvium	Mostly of gravel, sand, silt, and clay.	Where below water table, may yield small quantities of water to shallow wells.	Overlies the older units beneath the central parts of the valleys. Generally above the water table except in the lower parts of the valley.
Playa deposits	Consist principally of silt and clay.	Where saturated, the playa deposits yield little water to wells.	Found at Koehn Lake and at the base level of some minor drainage areas.
Windblown sand	Ranges in size from coarse to fine.	Does not contain water in usable quantities.	Generally occurs in the lower parts of the valleys, and, in part, is actively drifting. Above the regional water able.
Lakeshore deposits	Consist mainly of coarse gravel and sand with some silt and clay.	Does not contain water in usable quantities.	Occurs near large perennial lakes which formerly existed in the lowest parts of the valleys. Occurs above the regional water table.
Pleistocene			
Basalt	Igneous rock with a vesicular to dense texture.	Does not contain water in usable quantities	Occurs above the regional water table.
Older fan deposits	Moderately to highly indurated boulder gravel, cobble-pebble gravel, and sand locally cemented with calcareous cement.	These deposits yield little water to wells.[3]	Present locally.
Older alluvium	Poorly sorted arkosic gravel, sand, silt, and clay. Oxidized and generally unconsolidated, but in some places slightly cemented.	Permeable, yields water freely to wells, and is the most important water-bearing unit in the area.	Extends below the water table and underlies most of the valley floor.

[1]Based on Moyle, 1969.

[2]Near the hills and mountains the younger fan deposits are coarse grained, but they become finer with increasing distance from the areas of active erosion.

3 Lateral movement along the Garlock Fault has cut these deposits and has formed conduits that control the location of some small springs. The discharge from these springs is negligible.

Table 2.2. Top of Hard Sand.

Well	Approximate Ground Surface Elevation (ft amsl)	Total Depth (ft bgs)	Lithology Logged at Total Depth	Depth of Top of Hard Sand (ft bgs)	Approximate Elevation of Top of Hard Sand (ft amsl)
41	2175	800	Firm Sand	780	1395
43	2065	864	Hard Rock	850	1215
44	2145	800	Hard Sand	700	1445
45	2120	620	Hard Sand	585	—
46	2040	830	Hard Sand	820	1220
47	2250	887	Hard Sand	830	1420
48	2220	904	Hard Sand	813	1407
49	2165	800	Hard Sand	700	1465
50	2090	950	Hard Sand	935	1155
51	2090	785	Rock	–	–
63	2145	1740	Sand	–	–
Domestic	2180	505	Firm Sand	470	–

Key:
amsl = above mean sea level
ft = feet
Estimated from USGS topographic maps to +/- 20 feet.

The depth of the alluvium varies across the property due to faults in the bedrock. There are at least two faults in the area that affect the geology and hydrogeology of the FVR property. The western edge of the subject property is only a few hundred feet from the Garlock Fault, a major transform fault that forms the eastern boundary of the Sierra Nevada Mountains (Figure 2-2). The smaller Cantil fault, crosses the southern portion of the property, and is expressed as a slight surface scarp. This fault is one of a series of en-echelon faults splaying off the Garlock Fault. The significance of these faults is multifold. Most important is their effect on controlling the depth to bedrock, and hence the thickness and transmissivity of the alluvial aquifers. Based on gravity field data (Hanna, 1974) and well logs, at least the northern half of the ranch overlies a thick alluvial section. For example, the boring logs show that the depth to bedrock increases from about 500 feet south of the Cantil fault to over 1,790 feet in places north of the Cantil fault.

In addition, the faults may also act as either barriers or enhancement zones to groundwater flow, depending on subsurface conditions. In general, in this area north-trending faults and fractures will tend to be zones of transmission. In areas where the faults act as barriers, they are at least semipermeable barriers in place. This is indicated in the Cantil fault block by the rate of water level rise in the southwestern most wells.

Finally, the presence of these faults may have controlled the distribution of different types of sediments in the area. Garlock-related faults (such as the Cantil fault) have been active during the filling of this basin and at various depths may separate zones of thick coarse sediment material from zones of more fined-grained fluvial material.

LandSat Thematic Mapper (TM) imagery for this area indicates the presence of several lineaments crossing the property. Lineaments are linear surficial features that are thought to reflect crustal structure. There is an obvious lineament associated with the Cantil fault, which has over 1,200 feet of displacement to the north. However, it is not known whether any of the other lineaments represent other faults or fractures in the underlying bedrock at the FVR property.

2.2. HYDROGEOLOGY

The Fremont Valley is in the South Lahontan Hydrologic Study area. Surficial drainage and regional groundwater flow is toward Koehn Lake, a moist salt-encrusted playa.

2.2.1 Aquifer Geometry

The number of aquifers and aquifer geometries varies across the Fremont Valley. The existing data are inconclusive as to whether separate aquifers may exist at the FVR property. These data are discussed in the following sections, and summarized in Section 2.2.4.

Boring logs from the FVR property were used to evaluate the hydrogeologic units and potential confining layers at this site. As discussed above, the logs indicate that the study area is underlain by 450 to over 1,790 feet of alluvium, with the greatest thickness of sediments north of the Cantil fault. The alluvial sediments are predominantly coarse sand and gravel, but interbedded blue and brown clay layers have been logged in several wells at various depths. As previously discussed, a "hard" or cemented sand layer was also noted between 1,155 and 1,465 feet above mean sea level (amsl) in seven of the boring logs from onsite wells (Table 2-2).

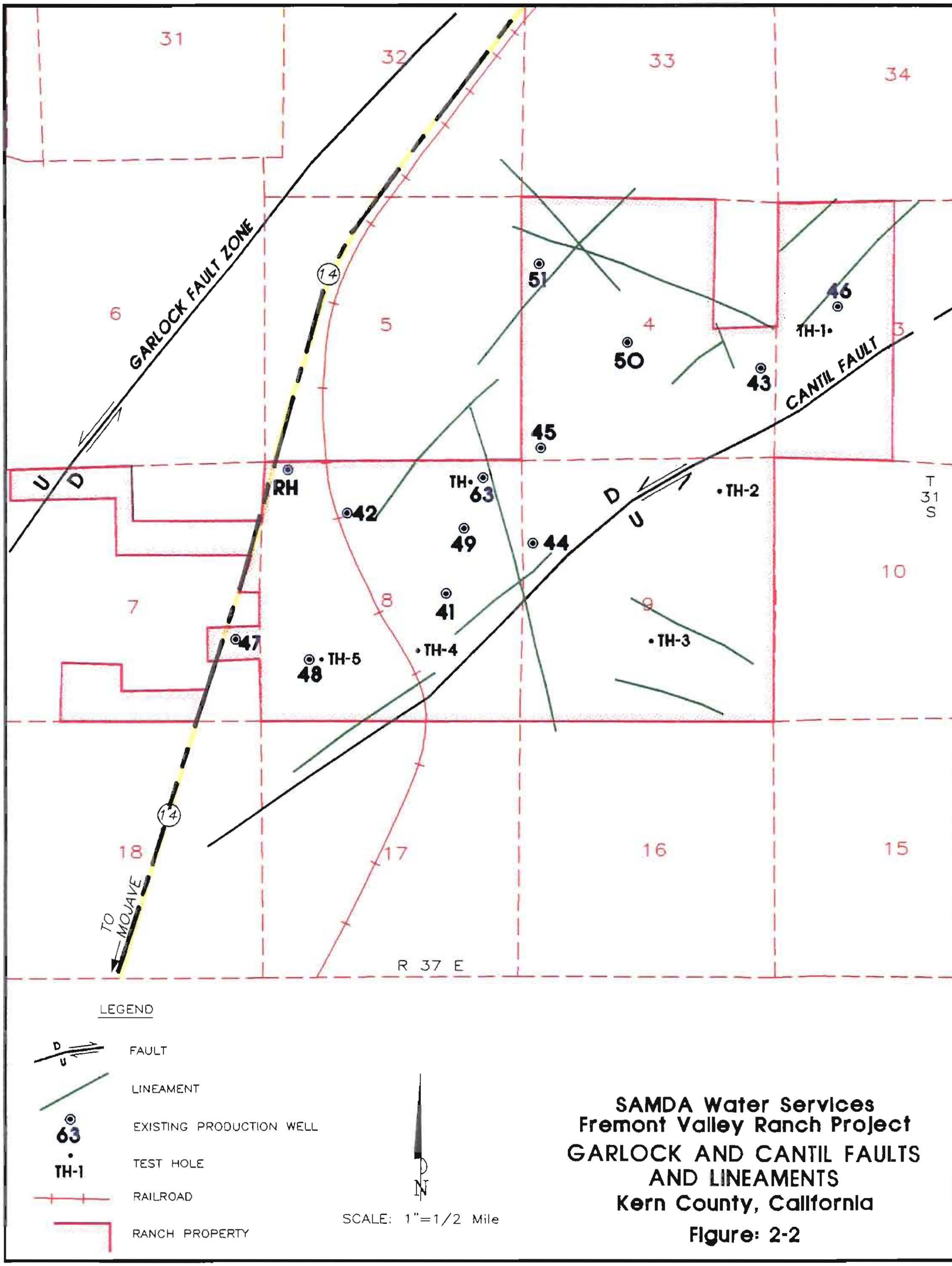
Based on the boring logs, the zones above the hard sand interval appear to be in overall communication with each other north of the Cantil fault. There may be localized areas that are semi-confined due to the playa deposits and clay lenses, but there does not appear to be an extensive confining layer extending across the entire property above this zone. The potential for a confining layer in or deeper than the hard sand could not be assessed from boring logs, because only one well went deeper than that interval.

2.2.2 Land Use and Pumpage

The water supply in the Fremont Valley is entirely from groundwater and the Los Angeles Aqueduct (Broadbent & Associates, 1989; USDI, 1992). Groundwater use in the Fremont Valley is predominately agricultural. Prior to the mid-1980's the bulk of groundwater pumpage historically occurred from numerous agricultural wells located to the southwest of Koehn Lake, with only minor pumpage for community water supplies and industrial use. However, now most groundwater extraction is northeast of Koehn Lake, and nearly half of the usage is for community water supplies and industrial use.

Historical and Current Usage - In 1960 a total of about 18,000 ac-ft per year was extracted from this area (Koehler, 1976). Groundwater usage of about 35,000 ac-ft/year in 1969 and about 60,000 ac-ft/yr in 1976 was nearly all attributable to agriculture. By 1989, usage had dropped to less than 20,000 ac-ft/yr, with 16,000 of this due to agriculture (GSi, 1993). The central portion of the Fremont Valley contains Koehn Lake, which is an ephemeral lake or playa. The saline groundwater below Koehn Lake most likely creates a barrier between the southwestern and northeastern Fremont Valley. For example, from 1956 to 1986, as groundwater levels declined in the Southeast as much as 240 feet due to large uses of groundwater for agricultural purposes, the northeast part of the Fremont Valley experienced declines of approximately only thirty (30) feet (Rand, 1995).

Groundwater usage has dropped sharply south of Koehn Lake. Landsat TM images from 1985 and 1996 were used to compare the land use in the Fremont Valley (Appendix G). The results, shown in Table 2.3, indicates how the nature of land use in the Fremont Valley and the overall water usage within it has changed dramatically. In 1986 there were about 9,800 acres in agricultural production and the estimated water consumption in the valley was 40,000 - 50,000 ac-ft per year. By 1996 most of this land had either been fallowed or converted from agricultural production to industrial use. There were three reasons driving the shift away from agricultural production: (1) dropping groundwater resulted in elevating pumping costs that made farming



SAMDA Water Services
Fremont Valley Ranch Project
GARLOCK AND CANTIL FAULTS AND LINEAMENTS
Kern County, California
Figure: 2-2

alfalfa uneconomical; (2) land speculators purchased property in the Fremont Valley before the real estate market began to decline in the late 80s and early 90s; and (3) Honda Corporation purchased 7,000 acres in order to install a test facility.

Table 2.3
Historical Land Use and Pumpage

YEAR	ACRES FARMED	ESTIMATED WATER CONSUMPTION (ac-ft)
1985	9,800	40,000+
1996	1,000-1,500	8,000-11,000

Current groundwater usage south of Koehn Lake is about 2,600 ac-ft per year. There are local water supply wells serving California City, and small communities such as Cantil and Rancho Seco. Cantil wells used less than 50 ac-ft in 1996 (Gordon, 1997) and Ranch Seco Water District used 45 ac-ft (McGrorry, 1997). Although Honda plans on expanding its facility, the 1996 use of 27.2 ac-ft will not increase substantially (Foster, 1997). The largest of the nearby communities, California City (population 5,955 in 1990), imports much of its water supply from the AVEK, and uses only 2,470 ac-ft/yr from wells in California City which is in a different sub-basin. Only one of the FVR wells has been used within the last decade.[4]

The total water consumption in the northeastern part of the valley is estimated at 8,195 ac-ft per year (Rand 1995). There are mining activities, limited agricultural operations and one municipal water district located in the northeastern Fremont Valley. The mining operations in total use less than 700 ac-ft annually (Rand, 1995). Continued agricultural use in the northeastern part of the valley by the Arciero family have used as much 5,000 ac-ft annually in the recent past. This number has declined as a result of less farming and will most likely continue the downward trend. Rand Communities Water District RCWD produces 64.5 ac-ft annually (Kelly, 1997).

Future Use - There is a potential that additional water consumption could occur in California City. A new prison will be constructed in 1998 and expansion of fast foods and grocery stores are possible as well (Helton, 1997). Nevertheless, groundwater consumption will not likely increase dramatically over the next ten years. The irrigated land that had been used to farm alfalfa is located in an area that can be characterized by high rates of evapotranspiration and soil that is permeable and sandy. Consequently, land use in the Fremont Valley has changed significantly and it is unlikely that it will return to agricultural use. The growth of urban areas in southern California as well as the landowners within the Fremont Valley (most significantly Honda Corporation) suggest that farming activities will not resume. If farming returns to the valley in the magnitude that it was conducted in the 1970s and 1980s, then the viability of the FVR project would come under question if a groundwater recharge program was not put in place.

When it was farmed, the FVR annually consumed in excess between 12,000 and 17,000 ac-ft. At the time, surrounding landowners pumped heavily and well levels began to drop. Samda does not intend to pump at the rates historically used on the FVR and the adjacent acreage is not being cultivated; additionally, the extraction of 10,000 ac-ft annually should not exceed the natural recharge of the basin or result in overdraft.

4. This well has been used as the domestic water supply for the tennant on site.

2.2.3 Water Quality

The state currently monitors water quality in wells located near the Fremont Valley Ranch Project area. The wells monitored meet the State's Title 22 standards. The groundwater monitoring program, however, will include an annual analysis to ensure that a deterioration in groundwater will not occur as a result of migration from Koehn Lake due to overpumping.

The potential effect on the proposed increased pumpage on the groundwater quality in the basin is considered to be minor. Water quality begins to deteriorate near Koehn Lake. The distance of several miles between the FVR and Koehn Lake and the annual water quality analyses will enable any related changes in the quality of the water to be identified early on.

2.2.4 Groundwater Elevation and Flow Direction

The water table elevation at the FVR property has fluctuated over time as a result of groundwater extraction and annual variations in precipitation. Onsite water levels dropped between the early 1960's when 18,000 ac-ft was extracted annually from the Fremont Valley and the 1980's when extraction approached 60,000 ac-ft per year. According to GSi, water level data collected by AVEK and the USGS indicates that water levels throughout the Fremont Valley dropped 60 to 175 feet during peak water production from the mid 1970's to the mid 1980's. Our assessment of these data indicates that the net drop in water levels between 1917 and 1997 varied from less than 10 to over 250 feet across the valley.

Regional Assessment - The water table elevation data from 1917 indicated that the water levels south of the FVR property and north of present-day California City were about 2073 to 2181 feet amsl. These data suggest that regional groundwater flow was toward Koehn Lake, although there appeared to be a groundwater high or local divide in the vicinity of Section 2 T32S, R37E. There were no water elevation measurements in the immediate vicinity of the FVR property; however, flowing artesian wells were noted about two miles northeast and two miles north of the FVR property. Groundwater elevations between the area west of the FVR property and Koehn Lake ranged from about 1,990 to 1,920 amsl.

The relatively shallow regional groundwater levels in wells reported in the early 1900's do not necessarily indicate that those sites were saturated to those levels. In the vicinity of Koehn Lake the upper 200 feet of sediments consist of fine grained material that may act to confine the principal aquifer below that level (Woodward Clyde, 1989; Koehler 1977; GSi 1993). As discussed previously in Section 2-1, only the northeastern portion of the FVR has more than a few feet of fined-grained sediments near the surface, so it is unlikely that the FVR would have shared in the same artesian conditions.

During the 1950's, the data suggest a slightly different pattern of water level elevations. Koehler's potentiometric surface maps (Appendix B) indicates that a subsurface groundwater divide was created south of Koehn Lake because groundwater lows developed north of the FVR (near the intersection of Sections 26, 27, 34 and 35 of T30N, R37E); and also across the Cantil Fault (near Section 2 of T30 N R38E). A change in water levels is indicated across the Cantil fault by Koehler.

Koehler's potentiometric surface for the mid-1970's data is similar to that for the 1950's data, except that the water levels are lower. From the mid 1970's to the mid 1980's, as agricultural properties were developed, water usage increased to 60,000 ac-ft and water levels dropped sharply in the region four to five miles south of Koehn Lake (see Hydrographs in Figures 2-3 and 2-4). However, hydrographs show that the rate of water level decline near California City remained fairly constant, and water levels actually increased in Wells 22N, 26N, and 18P in T30N, R38E at the peak of agricultural production in the early 1980's (Figure 2-5).

Water levels reached their lowest point in the central portion of the valley in the mid-1980's. By this time the low in the potentiometric surface west of the Cantil Fault had moved south to Section

4 of T31N R37E (see potentiometric surface maps in Appendix F). The location of the low on the east side of the fault apparently did not change. The hydrographs show that water levels began to rise in wells west of the Cantil Fault as soon as the pumping stopped. A slight decrease in water levels was observed north of the FVR in the early 1990's in the vicinity of Rancho Seco and the Honda facility, but water levels continued to rise after a couple years. Water levels in Well 6E, in the potentiometric low east of the Cantil Fault also showed a marked increase beginning in the early 1980's, and the decline in water levels in 36G and 30P flattened out at about the same time. Only a slight increase in water levels was observed in Wells 33H and 35N, south of Well 6E, and wells further south near California City did not show any response to the cessation of pumping in the central Fremont Valley area (Figures 2-4 and 2-5). Similarly, the hydrographs for wells north of Koehn Lake show a steady decline over time, and do not have any change in slope that corresponds to pumping from the central portion of the valley (Figure 2-6).

Measurements obtained in 1997 indicate that the lows in the potentiometric surface are being filled in over time. Average increases in water levels west of the Cantil Fault are between 5.5 and 6.7 feet per year near the FVR, and 1.9 feet per year further north in Section 27. Water levels in Well 6E are also increasing at a rate of over six feet per year. Water levels near the California City and north of Koehn Lake are gradually declining as a result of development and agriculture in those areas.

Local Changes in Water Levels - The first wells, 8C and 4N (Wells now referred to as Wells 42 and 45), were drilled at the FVR property in the early 1950's. These wells had initial water levels of 2,041 and 1,964 feet amsl, respectively. By 1973 and 1974, when most of the other wells at the FVR property were drilled, the onsite water table elevation had dropped to between 1,762 and 1,990 feet amsl (Figure 2-3). USGS data indicates that the water level in Well 8C dropped about 50 feet prior to the start of pumping in this well in 1973. There is only limited information that may explain whether this drop was due to regional pumping, or whether 8C was influenced by pumping well 4N about 1 mile away. Moyle (1966) classifies Well 4N as "I/U" meaning an unused irrigation well.

Other than initial production rates, the only water level data available for most of the late 1970's and 1980's is from wells 4Q and 4J (also referred to as Well 43) which were gauged annually as part of the USGS's regional assessment (Appendix D). The hydrographs for these wells (Figure 2-4) show that the water level in Well 43 rose 74 feet between 1986 and 1997, and the water level in Well 4Q rose 93 feet between 1985 and 1997.

Table 2.4 provides November 1997 water level measurements for select wells on the FVR property. Based on these measurements, current onsite water levels appear to have generally recovered to within 48 and 230 feet of where they were initially. However, they are still lower than the surrounding properties. The direction of groundwater flow is toward the intersection of Sections 4,5,8, and 9 (Figure 2-7).

Hydrographs of Groundwater Elevations for FVR Area

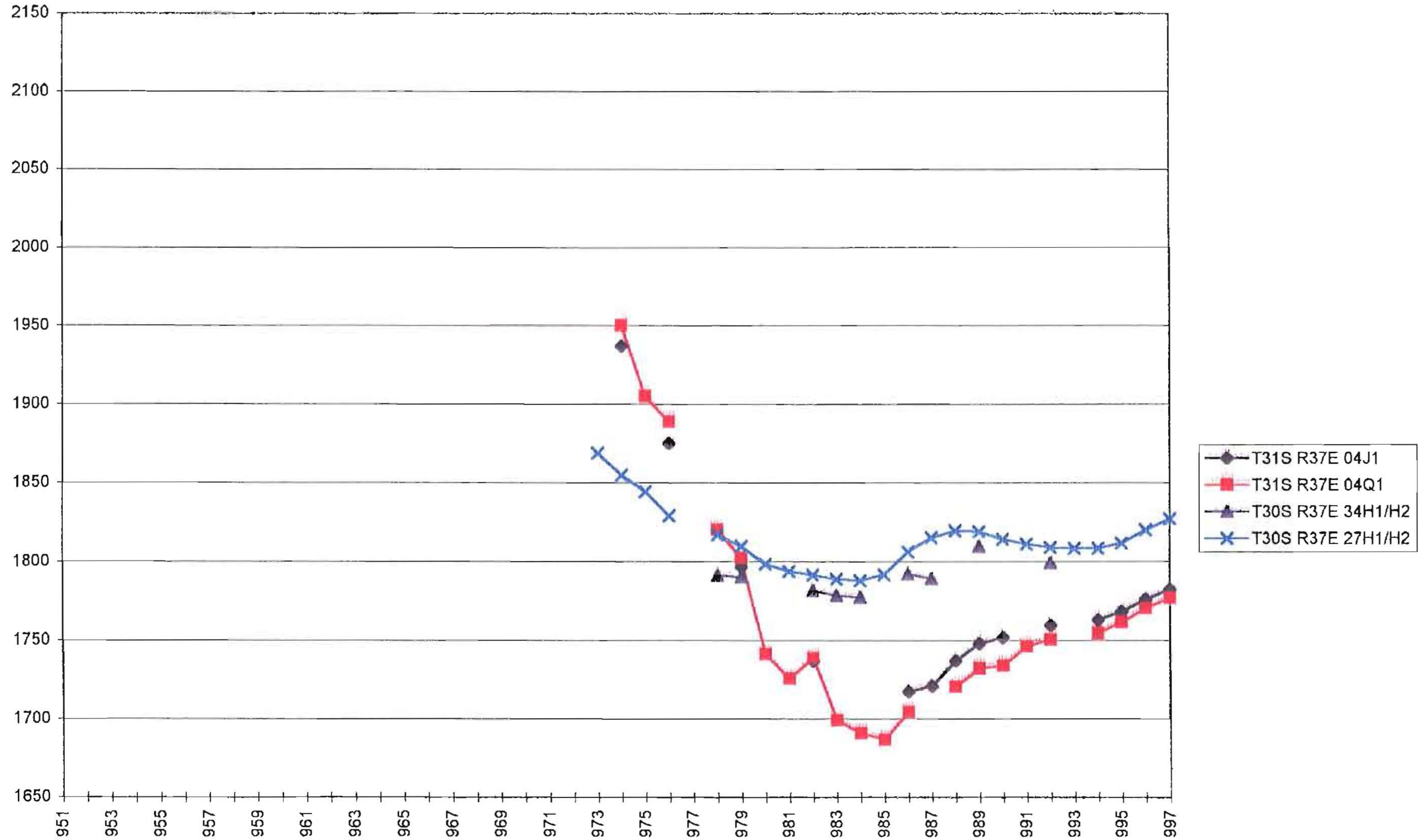


Figure 2.3

Hydrographs of Groundwater Elevations for Area East of FVR

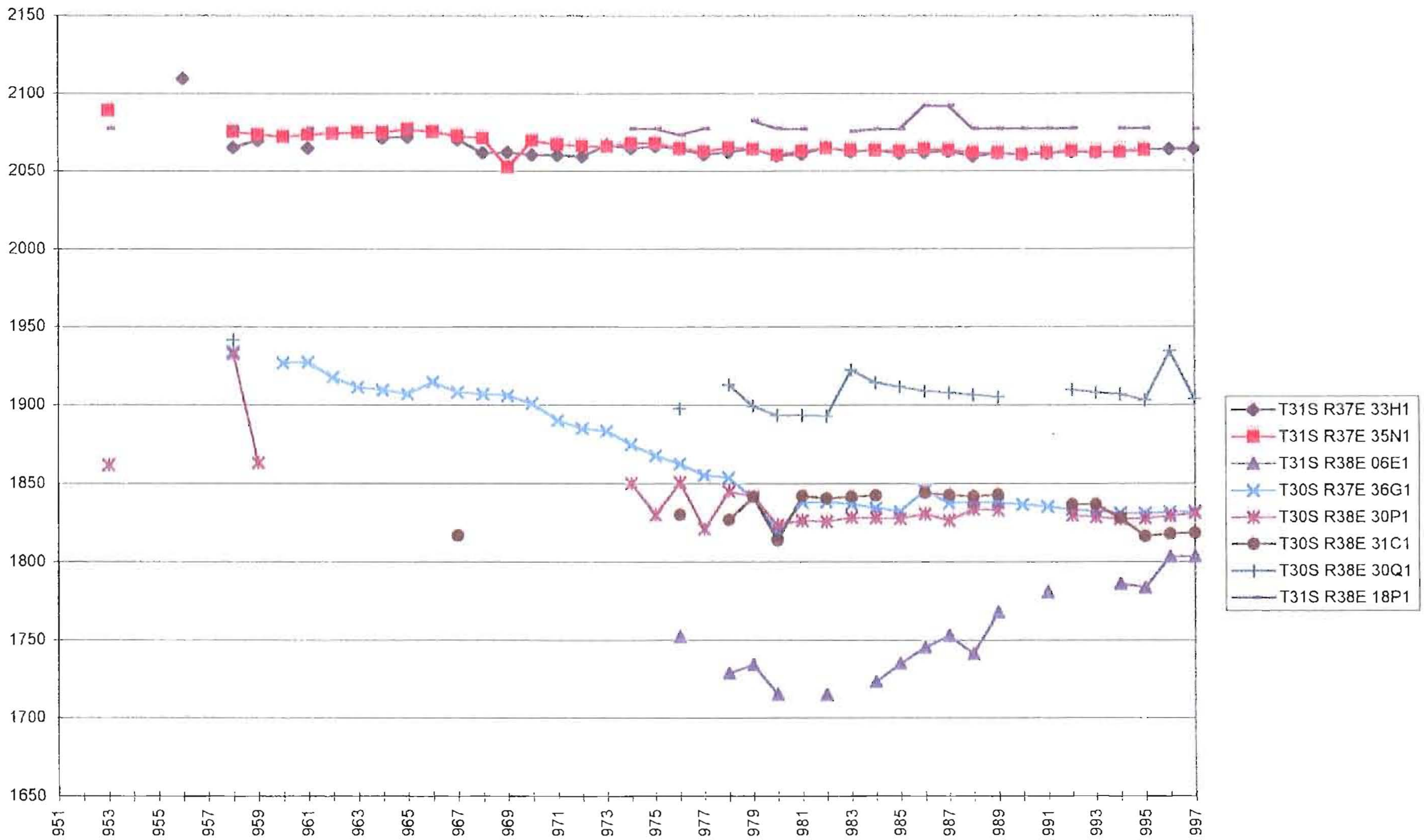


Figure 2.4

Hydrographs of Groundwater Elevations South of FVR

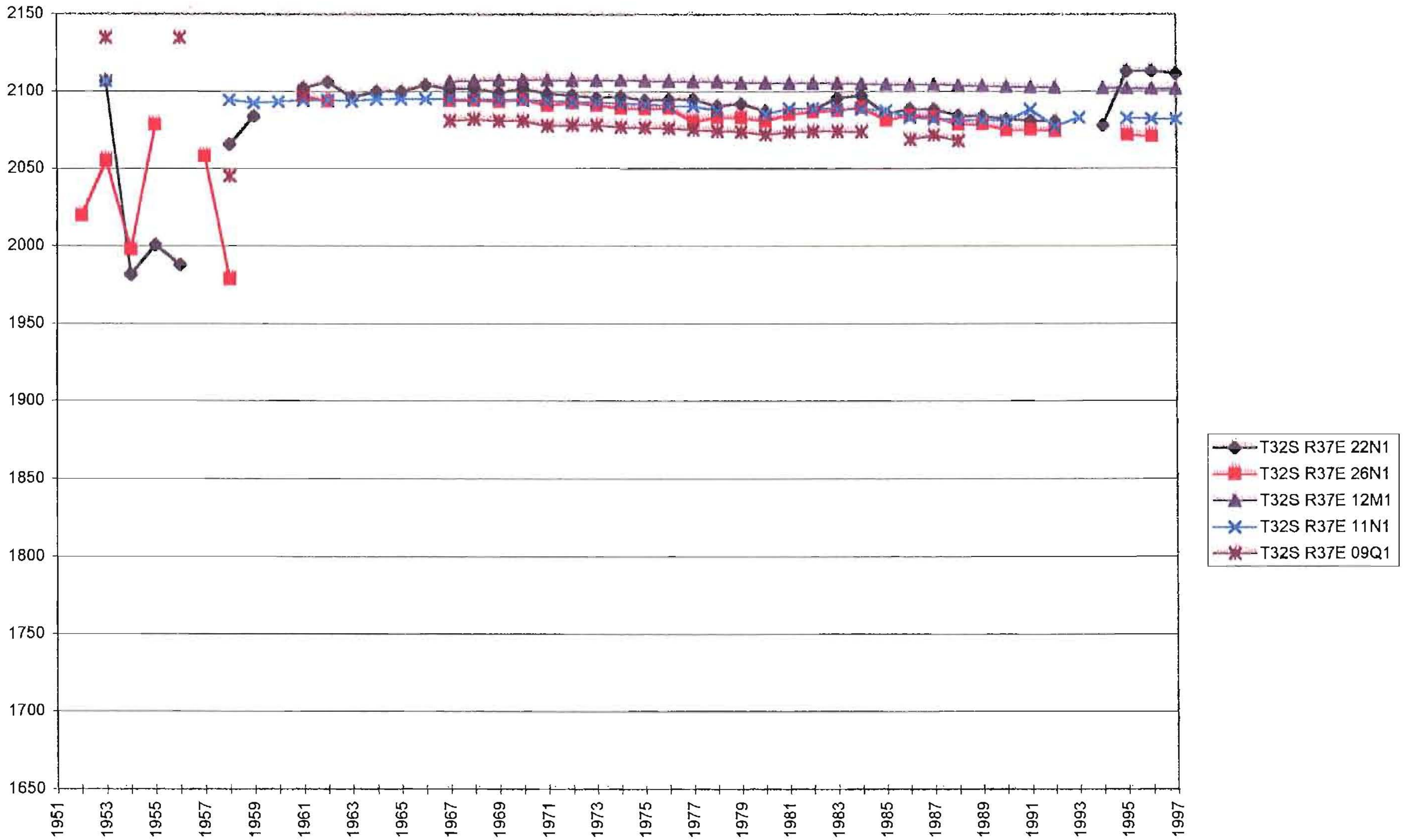


Figure 2.5

Hydrographs of Groundwater Elevations for Areas North of FVR

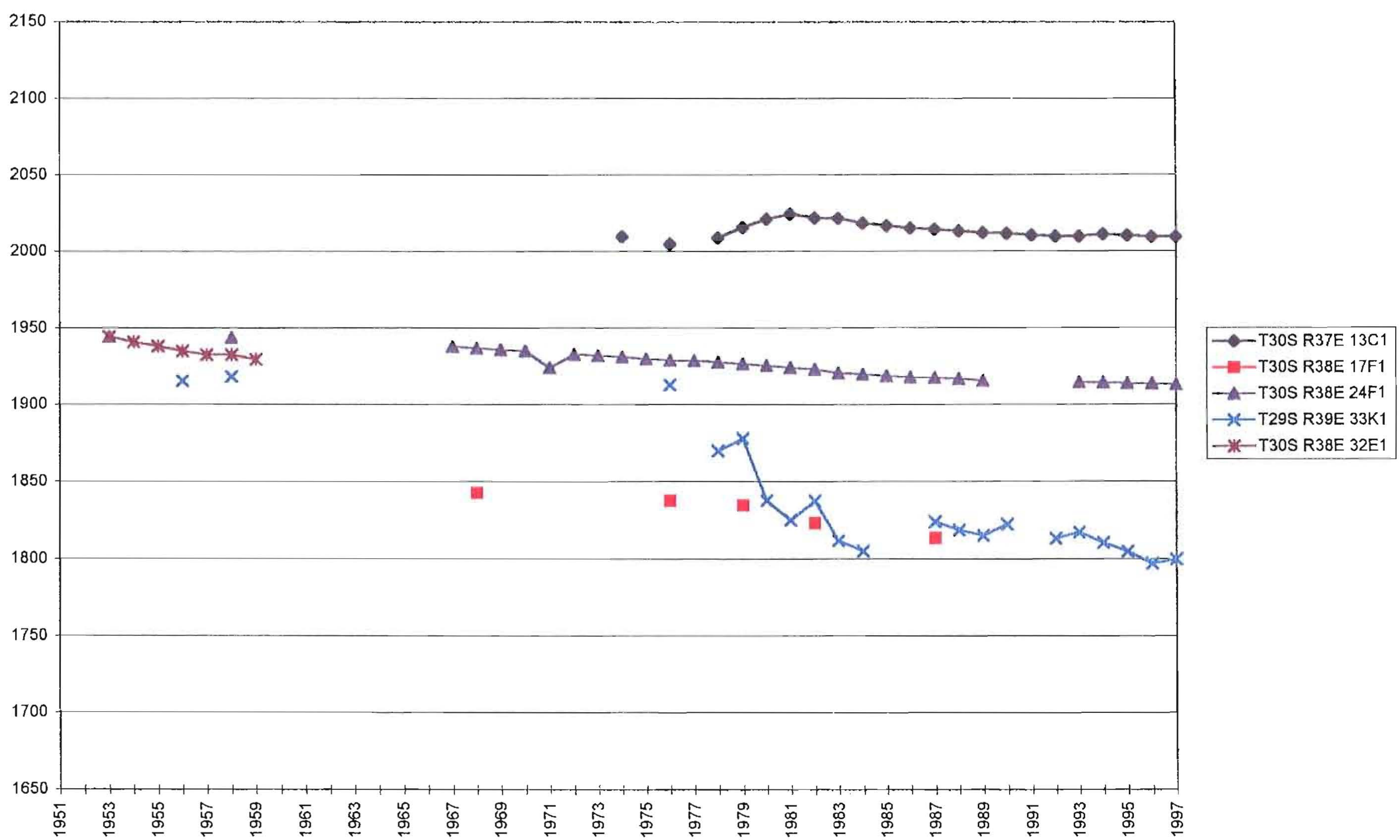
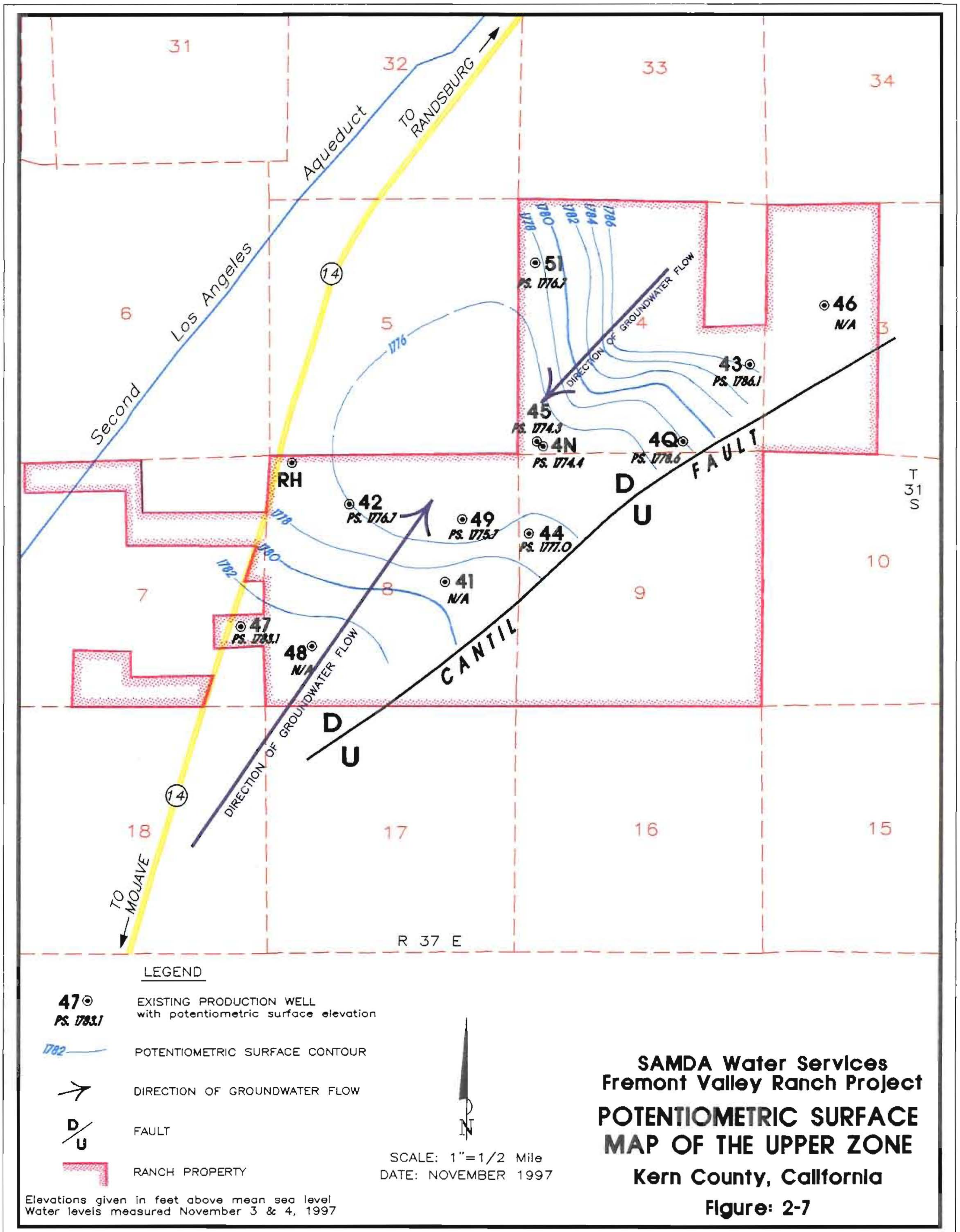


Figure 2.6



31
32
33
34
TO RANDSBURG
Second Los Angeles Aqueduct
14
6
5
4
3
51
PS. 1776.7
46
N/A
DIRECTION OF GROUNDWATER FLOW
1776
1778
1780
1782
1784
1786
43
PS. 1786.1
45
PS. 1774.3
4N
PS. 1774.4
4Q
PS. 1778.6
RH
42
PS. 1776.7
49
PS. 1775.7
44
PS. 1777.0
T 31 S
D
U
FAULT
CANTIL
10
7
8
9
41
N/A
47
PS. 1783.1
48
N/A
18
17
16
15
TO MOJAVE
R 37 E
LEGEND
EXISTING PRODUCTION WELL with potentiometric surface elevation
POTENTIOMETRIC SURFACE CONTOUR
DIRECTION OF GROUNDWATER FLOW
FAULT
RANCH PROPERTY
N
SCALE: 1"=1/2 Mile
DATE: NOVEMBER 1997
Elevations given in feet above mean sea level
Water levels measured November 3 & 4, 1997
SAMDA Water Services
Fremont Valley Ranch Project
POTENTIOMETRIC SURFACE MAP OF THE UPPER ZONE
Kern County, California
Figure: 2-7

Table 2.4 Select Water Level Measurements

Township S	Range E	Well Name	Wellhead Elevation (ft amsl)	Year Tested	Depth to Water (ft)	Water Level Elevation (ft amsl)
31	37	41	2174.5	1973	210.00	1,964.50
31	37	42(8C)	2172.5	1954	149.00	2,023.50
				1970's	418.00	1,754.50
				Nov-97	395.84	1,776.66
31	37	43	2067.5	1973	160.00	1,907.50
				Apr-86	350.2	1,717.30
				Apr-93	306.34	1,761.16
				Nov-97	281.41	1,786.09
31	37	44	2133.4	1974	260.00	1,873.40
				Nov-97	356.41	1,776.99
31	37	4N	2115	1959	156.00	1,959.00
				1962	193.00	1,922.00
				Nov-97	340.59	1,774.41
31	37	45	2114.1	1974	215.00	1,899.10
				Nov-97	339.79	1,774.31
31	37	4Q	2102.2	Feb 79	152.00	1,950.20
				Apr-86	401.50	1,700.70
				Apr-93	351.23	1,750.97
				Nov-97	323.55	1,778.65
31	37	46	2047.5	1974	235.00	1,812.50
31	37	47	2252.5	1974	290.00	1,962.50
				Nov-97	469.38	1,783.12
31	37	48	2220.5	1973	260	1,960.50
31	37	49	2146.1	1974	260	1,886.10
				Jul-97	375	1,771.10
				Nov-97	370.43	1,775.67
31	37	50	2080	1973	245	1,835.00
				Nov-97	293.92	1,786.08
31	37	51	2080.6	1976	185	1,895.60
				Nov-97	303.88	1,776.72
31	37	63	2130.1	1981	404	1,726.10
				Jul-97	349	1,781.10
				Nov-97	354	1,776.10
31	37	Dom(RH)	2180	1973	190	1,990.00
				Jul-97	420	1,760.00

Key:

amsl	= above mean sea level	E	= east
ft	= feet	W	= west
N	= north	T	= township
S	= south	R	= range

2.3 WATER AVAILABILITY IN EXCESS OF USAGE

2.3.1 Previous Studies' Results

There have been at least four other studies of recharge and groundwater usage of the Fremont Valley area. The approaches and results of these studies are summarized in Table 2-5.

Estimates of recharge to the Fremont Valley were previously calculated by GSi (1979, 1990, and 1993) and Koehler (1977). According to Anderson (1992), no one has yet devised a universally applicable method for estimating groundwater recharge. Numerous methods have been proposed, but most have met with limited success, most likely because there are significant spatial and temporal variations in groundwater recharge rates. Fremont Valley, like many other areas, has limited data available for use in evaluating recharge. Therefore a wide range of assumptions have been used in previous studies.

GSi (1993) specified a catchment area for the Fremont Valley of about 564,252 acres (880 mi^2). Rainfall averages between 5.95 and 6.25 inches in the desert areas, and about 11.5 inches per year in the mountainous regions (GSi 1993). Based on these values, GSi estimated that the total average annual precipitation equals 420,517 ac-ft. A chart of actual precipitation rates from Randsburg and Mojave is provided in Appendix E of this report.

According to Moyle (1969), there are three sources of recharge to the Fremont Valley:

(1) underflow from the Antelope Valley (Muroc subbasin) to the southwest;
(2) percolation of runoff from mountains; and
(3) percolation of runoff from desert.

In reviewing the range of potential infiltration values, we considered the advantages and limitations of each of the approaches summarized below and outlined in Table 2-5 (information on those approaches is provided in more detail in Appendix B).

- Koehler (1977) evaluated recharge in the vicinity of Koehn Lake by using runoff measured at three gauging stations, evaporation, and estimates of underflow from the three streams and the basins to the southwest to estimate recharge. He evaluated the drop in water levels to calculate estimated annual depletion and subtracted that from estimated use to get recharge for a portion of Fremont Valley. Based on this approach, Koehler calculated a recharge of only 700 ac-ft/yr from percolation of infiltration in this study area. However, he estimated that an additional 9,500 ac-ft/yr would come from underflow from the southwest. Koehler's study area included only 150 square miles, the northern portion of the Fremont Valley, and did not include Area 1 (California City area) and portions of Areas 2, 3, and 4.

- In 1979 GSi used a hydrologic budget with assumptions of 5.7 annual precipitation and an infiltration rate of 9.3% to calculate an average recharge of 24,400 ac-ft. This study area is equivalent to all the subareas shown in Appendix F.

- In 1990 GSi used hydrographs to calculate that average annual recharge was 9,555 ac-ft to 19,318 ac-ft. The study area equaled 170 mi^2, and the entire catchment basin used equaled 860 mi^2. These numbers correspond to infiltration rates of 4.6% and 9.3% respectively for the periods 1969-74 and 1984-89. Data from 1975 through 1983 were not included in the study because of the effects of pumping. Unfortunately, these years also had higher than average rainfall, which may make these average annual estimates slightly low.

- In 1993, GSi used estimates of annual precipitation and a range of infiltration rates of 1% to 10% to calculate an average annual recharge of 4,200 to 42,000 ac-ft for the period 1938 to 1992. GSi used Darcy's law and assumed transmissivity and gradients for each quadrant to calculate discharge of 18,000 ac-ft per year from Koehn Lake, in the absence of pumping.

Although Koehler (1977) was the only author to attempt to calculate underflow from the south, this underflow was also accounted for in the methods that used water level information. However, even these approaches may underestimate the recharge if the measured water levels were within the radius of influence of a pumping well (i.e., not the static water level).

Most approaches taken by the various authors to account for percolation from the mountains and desert seemed fairly reasonable but, as discussed below, we felt that the 700 ac-ft per year estimated by Koehler was based on assumptions that may make this value too low, and that the 42,000 ac-ft per year estimated by GSi was high.

Koehler's recharge value of 700 ac-ft for the northern valley included 500 ac-ft from stream underflow, about 100 ac-ft due to stream infiltration based on gauging data from the Goler Gulch, Pine Tree, and Cottonwood Creek drainage basins, and 100 ac-ft due to infiltration of precipitation in desert areas. Given that HydroSource (1997) estimated average annual underflow from Jawbone Canyon at 4,000 to 10,000 ac-ft, we believe that the value of 412 ac-ft per year is low.

GSi's estimated annual precipitation recharge of 42,000 ac-ft seemed too high given the declines in water levels observed when extraction rates were less than this value. Although rates for individual years have been calculated at over 90,000 ac-ft (GSi, 1993), it appears that the average annual ratewould be lower.

Table 2-5. Recharge Values Calculated For Fremont Valley By Various Authors

Author and Year	Approach	Estimated Recharge	Comments
USGS-Koehler (1977)	Used runoff measured at three gauging stations, evaporation, and estimates of underflow from the three streams and the southwest to estimate recharge. Used drop in water levels to calculate estimated annual depletion and subtracted that from estimated use to get recharge.	10,212 ac-ft (Northern part of Fremont Valley only.)	9,500 ac-ft/yr estimated to come from underflow. Calculated recharge of 200 ac-ft/yr from stream and precipitation infiltration, and 500 ac-ft/yr from stream underflow. Based stream basin calculations on three gauged streams. Effects of pumping wells on data not taken into account.
GSi (1979)	Used a hydrologic budget with assumptions of 5.7 annual precipitation an infiltration rate of 9.3%, and 134 mi^2 of aquifer area to calculate an average recharge.	24,400 ac-ft	Does not include underflow from southwest. Water levels in wells not used to derive this number.
1990 GSi	Used hydrographs to calculate average annual recharge. These numbers correspond to infiltration rates of 4.6% and 9.3% respectively for the periods 1969-74 and 1984-89. Data from 1975 through 1983 were not included in the study because of the effects of pumping. Study area equaled 170 mi^2; entire catchment basin of 860 mi^2.	9,555 to 19,318 ac-ft	This estimate is tied to measured water levels which enhances it credibility. However, the effect on the data from drawdown due to pumping at some wells is estimated but not known. Also, the years that were not included, 1975 through 1983, had higher than average rainfall. These two factors may make these average annual estimates slightly low.
1993 GSi	Used estimates of annual precipitation and a range of infiltration rates of 1% to 10% to calculate an average the annual recharge for the period 1938 to 1992. Study area equaled entire catchment basin of 880 mi^2.	4,200 to 42,000 ac-ft	This estimate is not tied to well performance and does not include underflow from the southwest. Used Darcy's law and assumed Transmissivity and gradients for each quadrant to calculate discharge of 18,000 ac-ft per year from Koehn Lake.

In summary, previous studies had estimates of average annual recharge that ranged from 4,200 (exclusive of underflow) to 42,000 ac-ft. Rates for individual years have been calculated at over 90,000 ac-ft (GSi, 1993).

2.3.2 EarthSat's Assessment Methodology

The previous investigations evaluated the potential for creating an overdraft by comparing the difference of estimated recharge for the whole Fremont Valley with estimated potential groundwater usage for the whole Fremont Valley. Given that there are now over 20 years of additional annual groundwater level measurements, we used the rationale that it is preferable to rely on real data, and to limit the use of assumptions when possible. We also recognized that faults and discharge points throughout the Fremont Valley may act to form sub-basins, so that conditions in the valley should be considered by subarea and also as a whole. For example, if water levels in the far corners of the Fremont Valley were rising rapidly, but the water table in the fault block that contains the FVR ranch was declining, resuming extraction from the FVR would cause an overdraft in that fault block even if there was a net increase in storage for the whole valley. Similarly if an overdraft exists in a fault block across Koehn Lake, groundwater extraction at the FVR will not be affected by it.

Bearing these factors in mind, an approach was used to evaluate water available in excess of usage for each portion of the study area, and for the valley as a whole. The first approach involved comparing the change in groundwater in storage between 1985 and 1997. The amount of available water in excess of groundwater use was then evaluated using a range of values for porosity. This approach was used because it involved using real data collected by the USGS, and depended on assumptions to a lesser degree. For example, it was not necessary to make assumptions concerning water balance elements such as total recharge, runoff, precipitation infiltration, or evaporation for this analysis. The estimated values for the total recharge to the valley were then compared to the range in previous author's results to ensure consistency with the physical setting.

As part of our approach, the valley floor was subdivided into smaller subareas based on the locations of the faults and Koehn Lake, and the observed water level response to pumping (Appendix F). We used historical annual USGS-measured water levels for this assessment. These files contained measurements (usually conducted in March or April) for a series of wells, dating as far back as 1951 through 1997. Imagery was used to identify cultivated areas in 1985 (Appendix G). Hydrographs were then prepared from the water level data (Figures 2-3 through 2-6) and reviewed to evaluate areas with similar groundwater response to pumping.

The interval of 1985 through 1997 was selected because it is relatively straight forward to estimate the amount of groundwater used for irrigation during that time period, thanks to satellite imagery that shows cultivated fields. Also, because the amount of water used for irrigation was less than the early 1980's, there is less error in the total volume if the estimates for usage are slightly off (i.e., a 10% error on 60,000 ac-ft equals 6,000 ac-ft; whereas a 10% error on 18,000 ac-ft equals only 1,800 ac-ft). In addition, the average precipitation measured in Randsburg for this time period is about 6.5 inches per year, close to the long-term average of 6.2 inches per year meaning that variations due to a drought or rainy years should equalize out.

For our analysis, a GIS file was built that contained a USGS raster file of the surface topography and cultural features and well locations. Measured groundwater elevations for 1985[5] and 1997 were plotted on this base and hand-contoured to account for the faults, Koehn Lake, topography, and areas of known heavy pumping. Potentiometric surfaces in 1985 were interpreted to be as consistent as possible with the 1975 potentiometric surface map prepared by Koehler (1977) (i.e. the 1985 data was honored but groundwater flow patterns were generally consistent). The 1985 map was then used as a guide to contour the 1997 vintage groundwater elevation data. Areas with limited data were interpreted so that contours of data from different dates overlay each other. This approach was used to minimize apparent change in groundwater storage due solely to contouring.

The contours were used to generate triangulated irregular networks (TIN's) for each year. Hard breaklines were incorporated into the TINs in order to account for discontinuous data associated with geologic faults in the study area. Water level depths (Z-values) at the faults were interpolated from raster surfaces generated from the original contours. Raster surfaces representing water levels were then developed from the TINs using the linear method of interpolation. The cells size for all raster surfaces was 300 feet, based on the resolution of the original contour interpretation performed at a scale of 1:100,000.

The change in water level from 1985 to 1997 was calculated and converted to volume by multiplying the change in z-value of each cell by the area of the cell. Zonal statistics operations were performed in order to calculate aggregate change in the volume of water for each study subarea.

[5]Where groundwater elevations from 1985 were not available, elevations from 1986 were used instead to be conservative.

The rest of our evaluation focused on Subarea 5 where the FVR is located. A preliminary range of estimated values for water available for extraction in excess of current usage was calculated by multiplying the increase in the volume of saturated sediments by specific yields of 11% and 15%, typical of silty sands (Fetter, 1980) and used by previous authors (Koehler, 1977 and GSi, 1993). Although most of the groundwater probably comes from the clean sand and gravels (with typical Sy values of 18 to 27%) noted in the boring logs, there are some clayey zones, so 11% to 15% was used. An estimate of water usage in 1985 and 1986 by farms that are no longer in operation was then added to the total volume.

The estimate of the water used after March 1985 in Subarea 5 for irrigation of alfalfa farms that are no longer in operation was made by multiplying the acreage under cultivation in Subarea 5 by 6.48 feet of water per farmed acre, the average amount used by the FVR when it was in operation. The cultivated acreage for Sections 8 and 9 south of the Cantil Fault was included because we know the water for those areas came from Subarea 5 (there were no wells south of the Cantil Fault at the FVR). The September 1985 imagery (Appendix G) indicated that there were 4880 acres under cultivation in Subarea 5 in 1985. We assumed that there were only 320 acres cultivated in this area in 1986 , and none from 1987 on.[6] This equals a total volume of 33,728 ac-ft of water usage for agriculture in this subarea during 1985 and 1986. Adjusting the change in water available by this amount, and dividing by 12 years (the duration of 1985 to 1997) equals 2,810 ac-ft per year. In Subarea 3 there were 3840 acres under cultivation in 1985 and no apparent cultivation in 1986. Using the same assumptions and approach, this equated to a total volume of 24,883 ac-ft and for an annual adjustment of 2073.6 ac-ft for our 12-year assessment. These values were then added to the total amount of potential groundwater available for extraction in excess of current usage for 1986 to 1997.

An additional calculation for recharge in excess of current usage was made by multiplying the increase in the volume of saturated sediments by porosity. This value is higher than that obtained by using Sy because the entire pore space is not dewatered during pumping (porosity equals Sy plus specific retention). We used an average porosity of 20% to make an assessment of recharge in excess of current usage.

2.3.3 Earthsat's Results of Recharge Assessment

The overall results, summarized in Table 2-6 are that there is 15,318 to 19,113 ac-ft net excess of water available for extraction in excess of usage for all of Fremont Valley. The amount available for Subarea 5 is 9,455 to 11,871 ac-ft (accounting for irrigation usage in 1985 and 1986).

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6 If there had been any additional irrigation since 1987 our assumption would tend to underestimate the amount of recharge to this subarea.

Table 2-6. Results of Recharge Analysis[a]

Sub-Area	Area (acres)	Area (mi²)	Total Change in Saturated Volume (ac-ft)	Total Change in Water Level (ft)	Annual Change in Water Level (ft/yr)	Annual Volume of Water Available in Excess of Usage (ac-ft/yr) Sy = 0.11	Annual Volume of Water Available in Excess of Usage (ac-ft/yr) Sy = 0.15	Annual Recharge in Excess of Usage (ac-ft/yr) n = 0.20
1	98145	153.4	-34683	-0.35	-0.03	-317.93	-433.54	-578.05
2	65897	103.0	115816	1.76	0.15	1061.65	1447.70	1930.27
3	27035	42.2	381315	14.10	1.18	3495.39	4766.44	6355.26
						[a] 5568.99	[a] 6840.04	[a] 8428.85
4	43833	68.5	6208	0.14	0.01	56.90	77.60	103.46
5	13990	21.9	724863	51.81	4.32	6644.58	9060.79	12081.05
						[a] 9,455.28	[a] 11,871.49	[a] 14891.75
6	17135	26.8	-109466	-6.39	-0.53	-1003.44	-1368.33	-1824.44
7	12103	18.9	54239	4.48	0.37	497.19	677.99	903.99
Total	**278138**	**434.5**	**1138292**	**65.55**	**5.46**	**10434.30**	**14228.70**	**18971.50**
Total	**278138**	**434.5**	**1138292**	**65.55**	**5.46**	**[a]15318.65**	**19112.95**	**23855.84**

Key: Sy = specific yield, n = porosity, ac-ft = acre feet

[a] Value includes water usage in 1985 and 1986 by farms that are no longer in operation.

Subarea 1, consisting of 153 mi² includes wells south of latitude 35° 11' 00" and west of the Rand Mountains. Imagery indicates that there was very little agriculture in this area, and that most groundwater extraction has probably been related to the development of California City. Hydrographs for the wells in this subarea are similar in that each of the wells generally showed a gradual decrease in water table elevation over time. However, the net decrease in groundwater elevation varies from less than five feet a few miles south of the FVR to over 70 feet near California City.

One well, T32S R37E 22N, had a sharp increase of 30 feet in its water level, beginning in 1993. Prior to that time, the water levels in this well had tracked well with those in Well T32S R37E 26 N. The reason for this increase was not known at the time this report was prepared.

The total change in groundwater storage in this area between 1985 and 1997 averaged -0.35 feet over the entire area; the average annual change is -0.03 ft/yr. Using a range of Sy between 11% and 15% indicates that extraction is exceeding recharge by -317.93 acre-ft per year in this area. Based on the 1986 and 1997 imagery, there was only limited agricultural usage in 1985, so no adjustment was added to these numbers.

Subarea 2 includes 103 mi² in the region north and east of a fault. Groundwater elevations and imagery indicate that very little water extraction has taken place in this area. The three wells in this area with ongoing historical data show only minor change in water levels since the mid 1980's. The net change in water levels is within the range of variation observed from year to year in the hydrograph for the only well with long-term data -- Well T31S R38E 18P. Also, this well is very shallow, less than 200 feet below ground surface, and may not be indicative of groundwater fluctuations at depth. Because of this, the estimates of recharge and volume of water available in excess of usage for this subarea should be considered to be very approximate due to limited data.

Subarea 3 includes the 42 mi^2 region east of the Cantil Fault, south of Koehn Lake, west of the Rand Mountains, and north of latitude 35° 11' 00". This area had heavy agricultural development between the 1960's and mid 1980's. Several different trends were observed for the wells in this region. Observed water levels in well 33H and 35N are higher than those in the agricultural region north of them and have fluctuated only about 12 feet since 1960. In T30S, R38E, wells 30P, 31C and 30Q are closely-spaced, with 30Q completed in a shallower aquifer than the other two wells. The water levels tend to be within ten feet of each other, but 30Q is consistently higher. All of these wells have had water levels that fluctuated as much as 20 feet between consecutive years. These water levels are generally lower than they were in the late 1950's, and have shown minor, if any, increase in response to the cessation of pumping.

Well T30S R37E 36G showed a steady decline until the mid 1980's, but has only had a net rebound of less than one foot since pumping stopped. Well 6E had the lowest water levels in this area when pumping stopped, and has had the highest rate of increase since then, averaging over six feet per year.

The total change in water levels for this subarea between 1985 and 1997 is estimated to be an average of 14.10 feet, or about 1.18 feet per year. Without correcting for agricultural use in 1985 and 1986, this corresponds to an annual volume of water available in excess of usage between 3,495 and 4,766 ac-ft. The actual amount (after the correction is made) is 5,568.99 to 6,840.04 ac-ft per year.

Subarea 4 includes a 68.5 mi^2 area east of the Cantil Fault, and north of Koehn Lake. This is the area where the Rand Mine and ongoing agricultural land usage is located. The potentiometric surface for this area relied on water level data included in GSi's (1993) report, as well as the information contained in Appendix B of this report. As previously discussed, several of the hydrographs for this area show slight decline over time, while others are fairly flat. The estimated average change in water level between 1985 and 1997 is 0.01 feet per year.

The annual volume of water available in excess of usage was estimated to be between 56.9 and 77.6 ac-ft; i.e., the data suggest that recharge is very nearly equal to extraction in this area.

Subarea 5, west of the Cantil Fault and south of Koehn Lake, contains 21.9 mi^2 and includes the FVR property. The change in water levels in response to pumping was previously discussed in Section 2.2. This area was one of the most heavily pumped areas prior to 1986 and has the largest average rebound in total water levels since 1985 -- 51.8 feet. This is equivalent to an annual average increase of 4.32 feet per year. The amount of water available in excess of usage is estimated to be 9,455 to 11,811 ac-ft per year for a specific yield of 0.11 and 0.15, respectively. This is approximately equal to a recharge rate in excess of usage of 14,891.75 ac-ft per year based on a 20% porosity.

These values are consistent with the location of this subarea adjacent to the relatively large drainage basins such as Pine Tree and Jawbone Canyon, and the relatively little current water usage in Subarea 5 (less than 120 ac-ft per year by Rancho Seco, Cantil, Honda and various domestic wells; and only minor cultivation).

Subarea 6 consists of 26.8 mi^2 west of the Cantil Fault and north of Koehn Lake. The slightly declining water levels indicate that there is a slight overdraft in this area (-1,824 ac-ft per year). The estimated annual change in water levels is -0.53 feet. This is one of the only areas in the valley with ongoing agricultural usage.

Subarea 7 west of the Garlock Fault consists of 18.9 mi^2. There is very little current usage of groundwater in this subarea, and annual recharge in excess of usage is only 904 ac-ft per year. However, this estimate is based on limited data and should be considered to be very approximate

2.4 Fremont Valley Ranch Well Monitoring Program

To ensure that there are no negative effects to the aquifer's water table as a result of pumping Fremont Valley Ranch (FVR) wells, Samda has initiated a local groundwater monitoring program. This program consists of collecting routine water level measurements on the non-pumping wells which exist on the ranch property. Five wells (#42, 46, 48, 49 & 51) will be utilized as monitor wells (see well locations on Figure 2-1).

In addition to this program, Samda will also collect and incorporate water level data from wells on the adjacent properties and local municipal users. Non-operational neighboring wells, owned by Honda Motor Corporation, as well as municipal users in California City, Rancho Seco and Antelope Valley Water Company will also be contributing water table data. The five local wells, monitored bi-annually by the U.S. Geological Survey, will provide historical and future water level data to be used as a reference guide. This regional data, combined with the local data from the FVR, will provide a comprehensive model of any possible water table fluctuations associated with the pumping schedule.

Water level measurements collected prior to production pumping will be used to set up the baseline datum. This data will assist Samda staff in determining the pre-pumping water table, the reference point by which future measurements will be compared.

Data collected from these wells will be incorporated into a database to determine effects on the local water table. This monitor data will be on file at the Samda office and will be published with the monthly production data. Annual reports will also be submitted to the Lahontan Regional Water Quality Control Board, Kern County Water Agency, Antelope Valley-East Kern Water Agency, City of California City. If this data reflects any significant change to the water table that could be construed as detrimental, adjustments will be made to the pumping schedule to rectify the situation.

If remedial action is necessary to mitigate the effects of a static water table decline, Samda shall contribute to the funding of the remedial action in the amount directly proportional to the amount of water Samda has pumped from the southwestern Fremont Valley as compared to the total amount pumped from the southwestern Fremont Valley by all groundwater producers over the life time of the project. More specifically, should Samda's pumping activities result in significant changes in the groundwater table and pumping costs increase as a result of Samda activities for nearby landowners, then Samda will pay for increased lift costs.

2.5 Effect on Vegetation

Based on the depth of groundwater in the Fremont valley, any water level declines due to pumpage are not expected to impact the naturally occurring vegetation in the valley or cause significant effects to pumpers in the area. Most of the natural vegetation belongs to the Creosote Brush scrub community, which is characterized by limited surficial root systems that do not rely on groundwater sources (USDI, 1993). Additionally, because of past farming activities in the area, there is little if any native vegetation within the project area. In those places where there is native vegetation are located to the west of Highway 14, a significant distance away from the pumping area. Regional water level declines may affect vegetation in the valley that does rely on groundwater sources. A few phreatophyte species were observed near Koehn Lake. These species have root systems that extend to the water table. However, the groundwater monitoring program will determine whether or not these species will be affected if there is a significant change in the levels of groundwater.

2.6 Effect on Subsidence

Subsidence has been reported in the area and has been expressed as a concern by local landowners (Saint-Amand 1991; Foster 1997). This has been particularly true in those areas of the valley which are underlain by clays. As water is extracted, the clays compact and subsidence occurs. This problem is more pronounced in areas where confined aquifers are being produced.

It is unlikely that subsidence will be a problem at the FVR property. Based on boring logs, there are no clay layers above 1400 feet above mean sea level that extend across the entire property, but there are clay lenses present in localized areas. Many, but not all, of these lenses are above the current water level; (i.e., they have already been dewatered), and will not be effected by extraction. However, it is not known whether pumping may cause localized subsidence from compaction of clay lenses beneath the water table. Although there are signs of localized subsidence to the north of the FVR property, there are not any signs on the property itself. Also, as emphasized above, the current data are inconclusive as to whether a confined aquifer exists on the FVR property. To account for these uncertainties, the monitoring program will be established to evaluate whether subsidence is occurring.

In order to ensure that subsidence does not occur as a result of pumping activities on the FVR, Samda will use local surveyors taking measurements every five years so that subsidence is detected immediately if it occurs. If subsidence does occur, then the effects of it will be evaluated and mitigated. Once it has been determined by independent analysts that Samda's pumping activities caused subsidence, mitigation efforts could include payment for the costs of the structures affected by subsidence.

2.7 CONCLUSIONS

This section presents EarthSat's conclusions regarding our limited hydrogeologic evaluation. These conclusions may be summarized as follows:

- Although the potential exists for multiple aquifers onsite, there is no data to conclusively establish this;

- All of the existing onsite wells north of the Cantil fault penetrated permeable formations and have previously tested at greater than 2,000 gpm, with sustained production of 1,000 gpm;

- Regardless of whether there is more than one aquifer, there appears to be good potential for additional production from the deeper sands if additional wells are drilled. The pump test did not indicate that Well 63 is in a limited fault block, and most of the surrounding wells were completed in hard sand as opposed to bedrock. Well 63 is completed in an area where gravity data indicates an increased sediment thickness, and this area extends north of the Cantil fault.

- Faulting plays a major role in controlling water production in this area. Specifically, the area south of the Cantil fault will not be productive because of a relatively shallow depth to bedrock.

- Based on groundwater elevations, groundwater flow is toward a low area in the southwestern corner of Section 4. Groundwater flow in the past was toward the northeast.

- Previous studies' estimates of average annual recharge ranged from 4,200 (exclusive of underflow) to 42,000 with most estimates indicating average annual precipitation infiltration rates between 10,000 and 25,000 ac-ft/yr.

- The information at this time suggests that total extraction may be between 8,000 and 11,000 ac-ft per year.

- The annual volume of water available in excess of usage in Subarea 5, where the FVR is located is 9,455 to 11,871 ac-ft.

- 15,319 to 19,113 ac-ft per year net excess of water is available for extraction in excess of usage for all of Fremont Valley.

- The sum of current usage and the estimate of water available for extraction in excess of usage is about 23,319 to 30,113 ac-ft per year, consistent with previous work based on measurements that include data through the 1990s.

Based on these results, it appears reasonable that water could be extracted at a rate up to 10,000 ac-ft per year in a safe and sustainable manner. The optimum rate should be determined through the use of a groundwater elevation monitoring program to ensure that an overdraft does not occur. The monitoring program should account for periodic fluctuations in the water table due to variations in precipitation, and establish criteria that take this into consideration.

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APPENDIX A
ONSITE BORING LOGS

KERN COUNTY WATER AGENCY

FACSIMILE TRANSMISSION

11/14/94
Date

22
(Number of pages including cover page)

To: NAMCO Capitol GrP Ph. 310 208 70c
Erzi Namvar Fax (310) 312-3c

From: Thomas C. Haslebacher

Telephone: (805) 634-1400

INSTRUCTIONS TO ADDRESSEE:

D.W.R. Drillers Reports
T31S/R37E, Sec. 3, 4, 7, 8
Fremont Ranch

OUR FACSIMILE MAY BE REACHED BY CALLING (805) 634-1428.

IF YOU HAVE ANY PROBLEMS WITH THE RECEPTION OF THIS TELECOPY TRANSMISSION, PLEASE CALL SENDER AT (805) 634-1400.

KERN COUNTY
WATER AGENCY

3200 Rio Mirada Dr.
P.O. Box 58, Bakersfield, CA 93302-0058
Phone: 805/634-1400 Fax: 805/634-1428

Direct: 634-1450

THOMAS C. HASLEBACHER GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

DUPLICATE
Retain this copy

WATER WELL DRILLERS REPORT

Do Not Fill In
№ 82562
State Well No.
Other Well No.

South West Ranch #41

(1) OWNER:
Name Robert C. Reynolds
Address 10889 Wilshire Blvd.
Los Angeles, Calif. 90024

(2) LOCATION OF WELL:
County Kern Owner's number, if any 41
Township, Range, and Section Sec. 8 T-31-S R-37-E (N ½)
Distance from cities, roads, railroads, etc. ~~Approx. 1320' ... of N line~~ SW¼ of NE¼ of 8

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:
STEEL: OTHER:
SINGLE ☐ DOUBLE ☐

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft. (If gravel packed)	To ft. (If gravel packed)
~~0~~	~~795~~	~~16"~~	~~1/4"~~	~~26"~~	0	795

Size of shoe or well ring:
Size of gravel: No. 4
Describe joint: welded

(7) PERFORATIONS OR SCREEN:
Type of perforation or name of screen: Mill Cut

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
~~260~~	~~795~~	~~16~~	~~2~~	~~2½ x .140~~

(8) CONSTRUCTION:
Was a surface sanitary seal provided? Yes ☐ No ☐ To what depth ft.
Were any strata sealed against pollution? Yes ☐ No ☐ If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing

(9) WATER LEVELS:
Depth at which water was first found, if known 210 ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing ft.

(10) WELL TESTS:
Was pump test made? Yes ☒ No ☐ If yes, by whom? Rottman Drilling Co.
Yield: gal./min. with ft. drawdown after hrs.
Temperature of water Was a chemical analysis made? Yes ☐ No ☒
Was electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:
Total depth 800 ft. Depth of completed well 795 ft.
Formation: Describe by color, character, size of material, and structure

From ft.	To ft.	Formation
0	15	Sand, gravel, small rocks
15	124	Med. to course sand & gravel & boulders
124	135	Boulders, coarse sand, gravel small rocks
135	150	Small rocks
150	220	Boulders, coarse sand & gravel
220	249	Boulders, coarse sand, small clay streaks
249	325	Small rocks, med. to course sand small layers of clay
325	480	Boulders, coarse sand, gravel & small clay streaks
480	530	Fine to med. sand
530	585	Med. to course sand, small clay streaks
585	655	Coarse sand, streaks of sandy clay
655	710	Fine to medium sand
710	780	Med. sand, small amount of clay
780	800	Firm sand

"WATER PERFORMANCE"
4100 GPM @ 225'
3500 GPM @ 222'
2800 GPM @ 220'
2400 GPM @ 218'
2000 GPM @ 214'
1800 GPM @ 212'

Work started 6/8 19 73, Completed 6/22 19 73

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Rottman Drilling Co.
(Person, firm, or corporation) (Typed or printed)
Address 121 W. Avenue I
Lancaster, Calif. 93534
[SIGNED] [signature]
(Well Driller)
License No. 117561 Dated July 3 19 73

SKETCH LOCATION OF WELL ON REVERSE SIDE

✓

[redacted]UPLICATE
[redacted]etain this copy

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT
#413

Do Not Fill In
№ 82568
State Well No.
Other Well No.

[redacted] OWNER:
Name Robert C. Reynolds
[redacted]dress 10389 Wilshire Blvd.
[redacted] Los Angeles, Calif. 90024

(2) LOCATION OF WELL:
C[redacted]nty Kern Owner's number, if any
T[redacted]nship, Range, and Section Sec. 4, T-31-S R-37-E (SE¼)
Distance from cities, roads, railroads, etc. 200' W of E line of
... 1400' north of S line.

[redacted] TYPE OF WORK (check):
N[redacted] Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

[redacted] PROPOSED USE (check):
D[redacted]mestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☒
Cable ☐
Other ☐

[redacted] CASING INSTALLED:
STEEL: OTHER:
SINGLE ☐ DOUBLE ☐

If gravel packed

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
[redacted]	306	16"	¼	26"	0'	306'

[redacted] shoe or well ring: No. 1 Size of gravel:
D[redacted]be joint Welded

[redacted] PERFORATIONS OR SCREEN:
Type of perforation or name of screen Mill Cut

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
[redacted]	306'	12	2	2½" x 140"

[redacted] CONSTRUCTION:
Was a surface sanitary seal provided? Yes ☐ No ☐ To what depth ft.
W[redacted] any strata sealed against pollution? Yes ☐ No ☐ If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Me[redacted]d of sealing

[redacted] WATER LEVELS:
Depth at which water was first found, if known 160 ft.
Standing level before perforating, if known ft.
St[redacted]ne level after perforating and developing ft.

[redacted] WELL TESTS:
Was pump test made? Yes ☒ No ☐ If yes, by whom Rottman Drilling Co.
gal./min. with ft. drawdown after hrs.
Te[redacted]rature of water Was a chemical analysis made? Yes ☐ No ☐
Was electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:
Total depth 864 ft. Depth of completed well 306 ft.
Formation: Describe by color, character, size of material, and structure
ft. to ft.

0 -	5	Surface soil
5 -	28	Silt
28 -	56	Coarse sand, small gravel and boulders
56 -	140	Coarse sand and gravel
140 -	140	Clay layers & Boulders
140 -	220	Layers of blue clay and silt
220 -	300	Coarse sand and gravel; heavy layers of brown clay
300 -	390	Coarse sand and gravel
390 -	502	Coarse sand and layers of clay
502 -	530	Blue clay, small layers of coarse sand, small gravel
530 -	653	Med. to coarse sand; small layers of brown clay
653 -	750	Med to coarse sand, blue and brown clay strks.
750 -	809	Med. to coarse sand, brown clay
809	850	Firm fine to med. sand
850	860	Hard fine sand
860	864	Rock

WATER PERFORMANCE

1700 GPM	@	210'
2000 GPM	@	223'
2200 GPM	@	235'
2400 GPM	@	238'
2550 GPM	@	250'

Work started 7/25/73 19 , Completed 8/4/ 19 73

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Rottman Drilling Co. (Person, firm, or corporation) (Typed or printed)
Address 121 W. Ave. I, Lancaster, Calif. 93534
[SIGNED] [signature] (Well Driller)
License No. 117561 Dated August 13 , 19 73

SKETCH LOCATION OF WELL ON REVERSE SIDE

DWR 188 (REV. 9-68)
28179-950 9-68 50M TRIP ∆ OSP

Do Not Fill In

No. 78369

State Well No.

Other Well No.

DUPLICATE
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Well #5 Phase II

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

44

(1) OWNER:

Name Robert O. Reynolds
Address 10889 Wilshire Blvd. Suite 1601
Los Angeles, Calif. 90024

(2) LOCATION OF WELL:

Phase II
County Kern   Owner's number, if any Owner #5
Township, Range, and Section NW¼ of Sec. 9, T31S, R37E, MDB & M,
Distance from cities, roads, railroads, etc. approx 1½ miles west of [illegible] Rd. & approx. 3½ miles no. of Phillips Rd. (Fremont Valley)

(3) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:

STEEL: X   OTHER:
SINGLE ☐ DOUBLE ☐

If gravel packed

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
~~0'~~	~~800'~~	~~16"~~	~~.375~~	~~26"~~	~~0'~~	~~300'~~

Size of shoe or well ring: Size of gravel: #4
Describe joint Welded

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen Mill Cut

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
~~300'~~	~~800'~~	~~12~~	~~2~~	~~2½" x .140~~

(8) CONSTRUCTION:

Was a surface sanitary seal provided? Yes ☐ No ☒ To what depth ft.
Were any strata sealed against pollution? Yes ☐ No ☐ If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing

(9) WATER LEVELS:

Depth at which water was first found, if known 260 ft. ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing ft.

(10) WELL TESTS:

Was pump test made? Yes ☒ No ☐ If yes, by whom? Owner Furnished
Yield: gal./min. with ft. drawdown after hrs.
Temperature of water   Was a chemical analysis made? Yes ☐ No ☐
Was electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:

Total depth 800' ft. Depth of completed well 800' ft.
Formation: Describe by color, character, size of material, and structure

ft. to		ft.	
0'	-	35'	Sand and clay
35'	-	120'	Med. to coarse sand
120'	-	145'	Small gravel
145'	-	200'	Med. to coarse sand, some small gravel
200'	-	230'	Med. to coarse sand, small boulders
230'	-	303'	Med. to coarse sand, hard packed
303'	-	365'	Med. to coarse sand, some clay
365'	-	426'	Fine to med. sand, clay strks.
426'	-	500'	Med. sand with some fine sand
500'	-	578'	Med. to coarse sand
578'	-	609'	Med. sand with clay streaks
609'	-	640'	Med. to coarse sand, some gravel
640'	-	670'	Brown clay, 20% med. sand.
670'	-	700'	Med. sand 20% brown clay
700'	-	800'	Med. to coarse sand, hard packed.

"Water Performance"

~~1800 GPM @268 ft.~~
~~2000 GPM @270 ft.~~
~~2200 GPM @270 ft.~~
~~2400 GPM @273 ft.~~
~~2600 GPM @275 ft.~~
~~2800 GPM @280 ft.~~
~~3000 GPM @280 ft.~~
~~3500 GPM @290 ft.~~

Work started July 22, 74 Completed Aug 26, 74

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Rottman Drilling Co. (Person, firm, or corporation) (Typed or printed)

Address 121 W. Ave. I, Lancaster, Calif. 93534

[SIGNED] [illegible] (Well Driller)

License No. 0117561 Dated August 26, 1974

SKETCH LOCATION OF WELL ON REVERSE SIDE

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STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

45

Do Not Fill In

No 78368

State Well No.

Other Well No.

(1) OWNER:

Name Robert C. Reynolds
Address 10880 Wilshire Blvd., Los Angeles, Ca. 90024

(2) LOCATION OF WELL:

County Kern
Owner's number, if any phase II Well #4,
Township, Range, and Section SW 1/4 of Sec. 4, T31S, R37E, MDB&M
Distance from cities, roads, railroads, etc. Cantil area, approx. 1 mi. [illegible] Rd. & approx 1/2 mi. north of Phillips Rd. SW 1/4 of SW 1/4

(3) TYPE OF WORK (check):

New Well ☐ Deepening ☐ Reconditioning ☐ Destroying ☐

If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☑ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☑
Cable ☐
Other ☐

(6) CASING INSTALLED:

STEEL: OTHER:
SINGLE ☐ DOUBLE ☐

If gravel packed

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	620'	16"	3/8" to 1/4"	26"	0	620'

Type of shoe or well ring:
Size of gravel:
Describe joint Welded

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen Mill Cut

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
200'	620'	12	2	2 1/2" x .140

(8) CONSTRUCTION:

Was a surface sanitary seal provided? Yes ☐ No ☐ To what depth ft.
Were any strata sealed against pollution? Yes ☐ No ☐ If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing

(9) WATER LEVELS:

Depth at which water was first found, if known ft.
Standing level before perforating, if known 215 ft. ft.
Standing level after perforating and developing ft.

(10) WELL TESTS:

Was pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Temperature of water Was a chemical analysis made? Yes ☐ No ☐
Was electric log made of well? Yes ☐ No ☐ If yes, attach copy

(11) WELL LOG:

Total depth 620' ft. Depth of completed well 620 ft. ft.

Formation: *Describe by color, character, size of material, and structure*

ft.	to	ft.	
0'	-	30'	Clay & sand streaks
30'	-	65'	Clay & sand streaks
65'	-	80'	Brown clay & sand streaks
80'	-	110'	Med. to coarse sand
110'	-	140'	Med. to coarse sand
140'	-	170'	Med. to coarse sand
170'	-	180'	Med. to coarse sand & some blue clay
180'	-	214'	Med. to coarse sand & some brn. clay
214'	-	240'	Med. to coarse sand & some brn. clay
240'	-	270'	Med. to coarse sand & some brn. clay
270'	-	300'	Coarse sand & some small gravel & some brn. clay
300'	-	330'	Brown clay & sand strks
330'	-	360'	Brown clay & med. to coarse sand & some gravel
360'	-	391'	Med. to coarse sand & blue clay
391'	-	422'	Med. to coarse sand & brown clay
422'	-	451'	Med. to coarse sand & brown clay
451'	-	493'	Brown clay & streaks of sand
493'	-	524'	Brown clay & med. to coarse sand
524'	-	556'	Brown clay & sand strks
556'	-	585'	Brown clay & sand strks (med. & coarse)
585'	-	620'	Fine to Med. sand (hard packed)

"Water Performance" on reverse side.

Work started 7/23/ 19 74 Completed 8/9/74 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME [illegible] (Person, firm, or corporation) (Typed or printed)

Address 121 W. Ave. I, Lancaster, Calif. 93534

Rottman Drilling

[SIGNED] L Rottman (Well Driller)

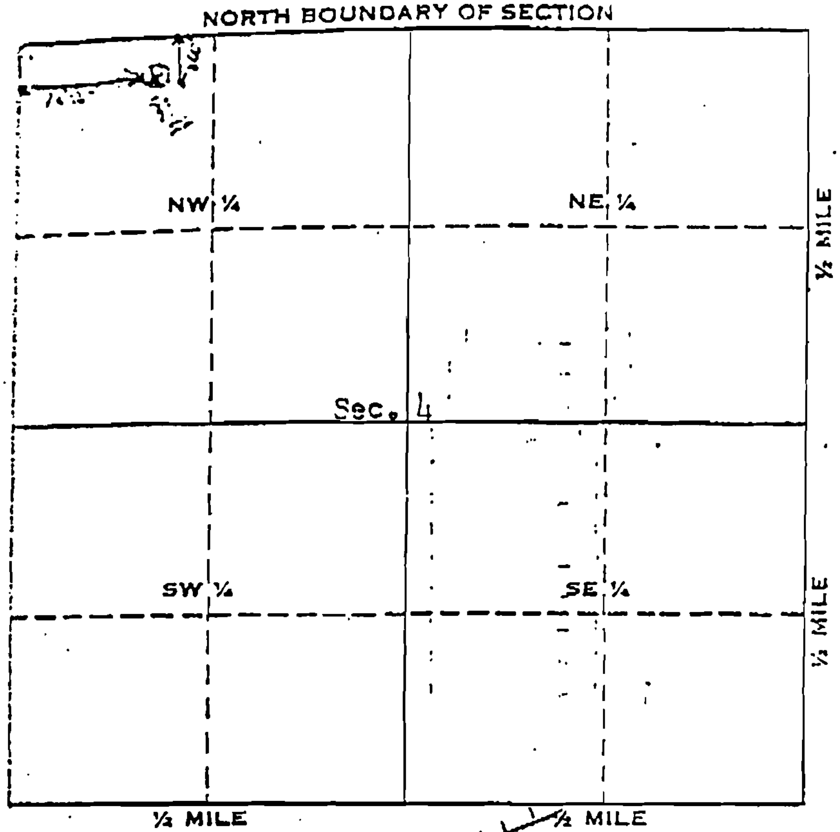
License No. C117561 Dated August 12 1974

SKETCH LOCATION OF WELL ON REVERSE SIDE

DWR 188 (REV. 9-68)

28179-950 9-68 80M TRIP OSP

WELL LOCATION SKETCH



A. Location of well in sectionized areas.
Sketch roads, railroads, streams, or other features as necessary.

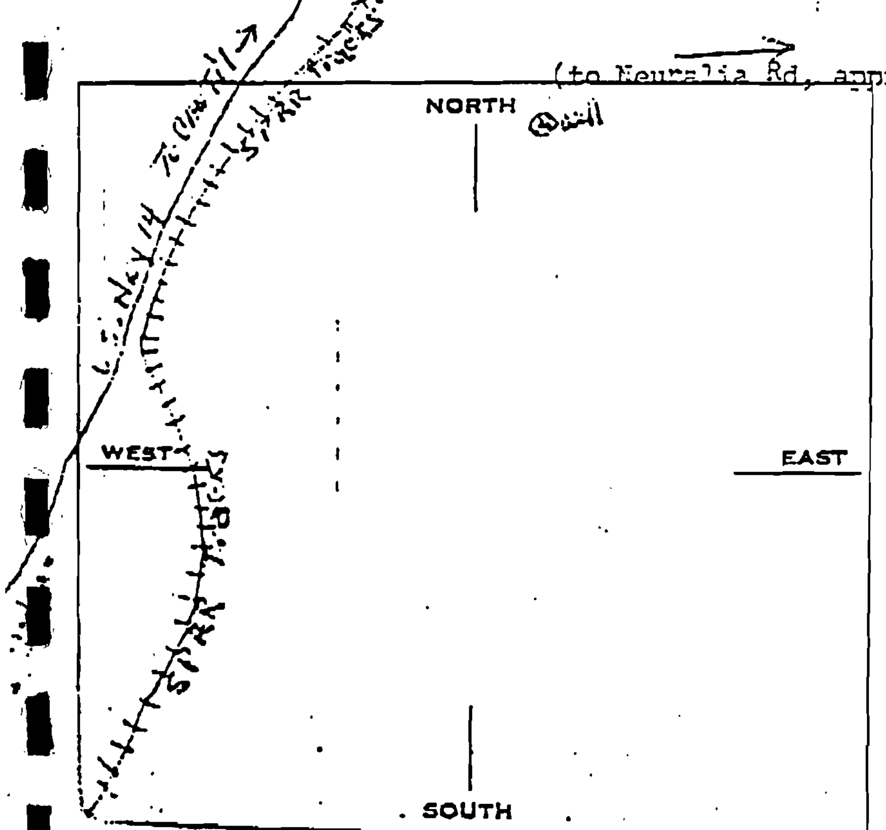
Township T31S N/S

Range R37E MDB&M E/W

Section No. NW¼ Sec. 4

In Kern County, Cantil area, approx. 1 3/4 mi. west of Neuralia and approx. 1 mi. south of SPRR tracks in Cantil.

(to Neuralia Rd, approx. 1 3/4 mi.)



B. Location of well in areas not sectionized.
Sketch roads, railroads, streams, or other features as necessary.
Indicate distances.

RECEIVED

DUPLICATE
Retain this copy

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

Do Not Fill In
№ 78363
State Well No.
Other Well No.

#46 Well #2 - Ro... II

(1) OWNER:
Name Robert O. Reynolds
Address 10889 Wilshire Blvd.
Los Angeles, California 90024

(2) LOCATION OF WELL: #2-Rosell
County Kern Owner's number, if any
Township, Range, and Section Sec. 3, T31S, R37E
Distance from cities, roads, railroads, etc. Cantil area, approx. 2750' west of Neuralia Rd. and 2750' ft. south of no. bdry of Sec. 3.

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:
X STEEL OTHER:
SINGLE ☐ DOUBLE ☐

From ft.	To ft.	Diam.	Gage or Wall	If gravel packed: Diameter of Bore	From ft.	To ft.
0	820'	16"	3/8"	26"	0	820'

Size of shoe or well ring: Size of gravel: #4
Describe joint Welded

(7) PERFORATIONS OR SCREEN:
Type of perforation or name of screen Mill Cut

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
275'	820'	12	2	$2\frac{1}{2}$" x .140"

(8) CONSTRUCTION:
Was a surface sanitary seal provided? Yes ☐ No ☒ To what depth ft.
Were any strata sealed against pollution? Yes ☐ No ☐ If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing

(9) WATER LEVELS:
Depth at which water was first found, if known 235 ft. ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing ft.

(10) WELL TESTS:
Was pump test made? Yes ☒ No ☐ If yes, by whom? Owner furnished
Yield: gal./min. with ft. drawdown after hrs.
Temperature of water Was a chemical analysis made? Yes ☐ No ☐
Was electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:
Total depth 830' ft. Depth of completed well 820' ft.
Formation: Describe by color, character, size of material, and structure

ft. to ft.	
0' - 20'	Surface soil
20' - 200'	Brn. Clay and fine to med. sand
200' - 240'	Med. to coarse sand & brn. clay
240' - 310'	Med. to coarse sand, grn. clay
310' - 330'	Coarse sand & sml. gravel
330' - 450'	Coarse sand & brn. clay
450' - 510'	Some coarse sand, mostly brn. clay (20%--80%)
510' - 580'	Very little sand, 80% blue green clay
580' - 610'	Little more med. sand. Brn. clay (30%-70%)
610' - 820'	Med. to coarse sand, sml. gravel; sml. layers brn. clay
820' - 830'	Med. to coarse sand; Hard pack (10' per hr.)

"Water Performance"

1000 GPM	@	275'
1200 GPM	@	280'
1400 GPM	@	285'
1600 GPM	@	290'
1800 GPM	@	300'
2000 GPM +	@	308'

Work started 5/28/74 19 Completed 6/24/74 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

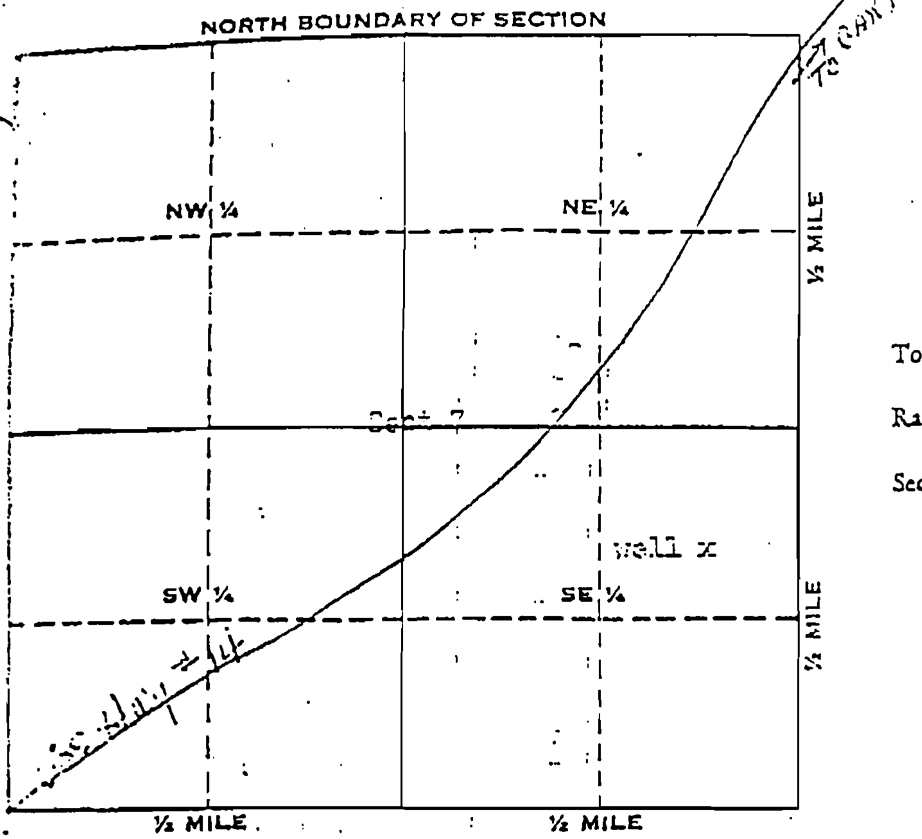
NAME ROTTMAN DRILLING CO.
(Person, firm, or corporation) (Typed or printed)
Address 121 W. Ave. I, Lancaster, Calif. 93534

[SIGNED] F. Rottman (Well Driller)

License No. 117561 Dated June 25, 1974, 19

SKETCH LOCATION OF WELL ON REVERSE SIDE

WELL LOCATION SKETCH



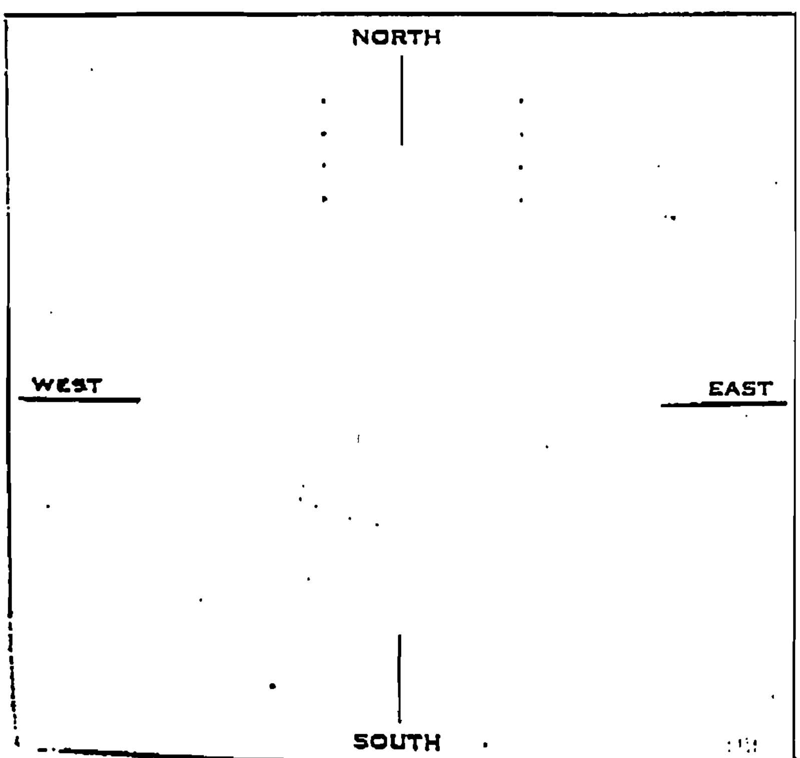
A. Location of well in sectionized areas.
Sketch roads, railroads, streams, or other features as necessary.

Township T31S N/S

Range 27E E/W

Section No. 7

In Kern County, Cantil area, well loca. approx. 1320' n. of the south boundry, and 700' west of the east boundry of sect. 7.



B. Location of well in areas not sectionized.
Sketch roads, railroads, streams, or other features as necessary.
... distances.

SEP 31 1974

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

ORIGINAL
File with DWR

Do Not Fill In
№ 78367
State Well No. 31S/37E-
#47
Other Well No.

(1) OWNER:
Name Robert O. Reynolds
Address [illegible]
[illegible]

(2) LOCATION OF WELL:
County Kern Owner's number, if any #3, Phase II
Township, Range, and Section Sec. 7, T31S, R37E, MDB&M
Distance from cities, roads, railroads, etc. Cantil area, approx 1320' [illegible] Sec. 7; 700' W. of east line of Sec. 7.

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:
STEEL: ☒ OTHER:
SINGLE ☐ DOUBLE ☐

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	If gravel packed From ft.	To ft.
0	310	16"	5/16"	26"	0	310'

Size of shoe or well ring: Size of gravel: [illegible]
Describe joint Welded

(7) PERFORATIONS OR SCREEN:
Type of perforation or name of screen Mill Cut

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
200'	310'	12	2	2½ x .140

(8) CONSTRUCTION:
Was a surface sanitary seal provided? Yes ☐ No ☒ To what depth ft.
Were any strata sealed against pollution? Yes ☐ No ☐ If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing

(9) WATER LEVELS:
Depth at which water was first found, if known 290 ft. ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing ft.

(10) WELL TESTS:
Was pump test made? Yes ☒ No ☐ If yes, by whom? Rottman Drilling.
Yield: gal./min. with ft. drawdown after hrs.
Temperature of water Was a chemical analysis made? Yes ☐ No ☐
Was electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:
Total depth 387' ft. Depth of completed well 310' ft.
Formation: Describe by color, character, size of material, and structure

ft. to ft.	
0' - 20'	Surface Sand/ Small boulders
20' - 60'	Med. sand with small boulders
60' - 100'	Coarse sand, large gravel, small boulders
100' - 165'	Med. to coarse sand, small boulders, and clay strips.
165' to 215'	Small boulders, coarse sand & clay streaks
215' - 260'	Med. to coarse sand, hard packed, small boulders
260' to 310'	Med. sand, hard packed, (1 hr. 20 min. per joint)
310' - 347'	Med. sand, thin layers, clay
347' - 362'	Med. sand, small gravel & clay strips.
362' - 380'	Med. sand, some coarse sand
380' - 387'	Med. sand, hard packed, (1 3/4 hrs. per joint)

"Water Performance"
2000 gpm. @ 302 ft. (31½")
2200 gpm. @ 304 ft. (38")
2400 gpm. @ 304 ft. (45")
3000 gpm. @ 306 ft. (64+")

CONFIDENTIAL NOT FOR PUBLIC RELEASE

Work started July 5 1974 Completed July 26 1974

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME ROTTMAN DRILLING CO.
(Person, firm, or corporation) (Typed or printed)
Address 121 W. Avenue I, Lancaster, Calif. 935
[SIGNED] [signature]
(Well Driller)
License No. 117561 Dated August 1 19 7

SKETCH LOCATION OF WELL ON REVERSE SIDE

ORIGINAL
e with DWR

Do not fill

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

No. 067826

d Intent No. 13485
mit No. or Date 0708-CT55A

W/ 1st 63 300' ±

State Well No. 31S/37E-
Other Well No.

(1) OWNER: Name Robert O Reynolds-Frank Arciero
Address 11661 San Vicente Suite 306
Los Angeles, Ca. Zip 90049

(2) LOCATION OF WELL (See instructions):
County Kern Owner's Well Number
Well address if different from above Fremont Valley Ranch Cantil
Township T31S Range R37E Section 8
Distance from cities, roads, railroads, fences, etc.
NE¼ of NE ¼ of Sec. 8

WELL LOCATION SKETCH
N
300'

(3) TYPE OF WORK:
New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☒
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other ☐

(5) EQUIPMENT:
Rotary ☒ Reverse ☐
Cable ☐ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☐ No ☒ Size
Diameter of bore 12¼
Packed from ft. to ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☐ Concrete ☐

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
No Casing Installed						
Well Abandoned						

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☐ No ☒ If yes, to depth ft.
Were strata sealed against pollution? Yes ☐ No ☐ Interval ft.
Method of sealing Bentonite -0-

(10) WATER LEVELS:
Depth of first water, if known ft.
Standing level after well completion ft.

(11) WELL TESTS:
Was well test made? Yes ☐ No ☐ If yes, by whom?
Type of test Pump ☐ Bailer ☐ Air lift ☐
Depth to water at start of test ft. At end of test ft.
Discharge gal/min after hours Water temperature
Chemical analysis made? Yes ☐ No ☐ If yes, by whom?
Was electric log made? Yes ☐ No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth 1515 ft. Depth of completed well ABANDONED

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	130	Fine to Med. Sand Gravel W/Brn C
		Streaks
130	140	Fine to Med. Sand & Boulders
140	220	Boulders & Coarse Sand
220	265	Hard Boulder & Fine Sand
265	346	Fine to Med. Sand & Some Brn Cla
		Streaks
346	350	Brn Clay w/ 10% Sand
350	370	50% Clay-50% Sand.
370	410	Sand & Gravel
410	440	Sand & Gravel W/ Clay streaks
440	470	70% Sand 10% Clay 20% Gravel
470	661	Fine to Med. sand
661	700	30% Brn. Clay 70% Fine Sand
700	756	Fine to Med. Sand
756	800	Med. Sand W/Clay streaks
800	820	10% Clay 90% Gravel
820	850	20% Clay 80% Gravel
850	856	40% Sand 10% Clay 50% Gravel
856	950	40% Sand 10% Clay 50% Gravel
950	1020	50% Sand 5% Clay 45 % Gravel
1020	1050	80% Sand 20% Clay
1050	1080	10% Clay 90% Gravel
1080	1240	60% Sand 30% Gravel 10% Clay
1240	1322	Fine to Med. Sand
1322	1416	Fine to Med. Sand
1416	1478	Fine to Med. Sand W/10% Clay
1478	1515	90% Clay 10% Sand

Work started 1-7-81 19 Completed 2-12 19 81

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED [signature] (Well Driller)
NAME Rottman Drilling Co.
(Person, firm, or corporation) (Typed or printed)
Address 121 West Ave. I
City Lancaster, Ca. Zip 93534
License No. 316599 Date of this report 4-9-81

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

[redacted] Well #1 Phase I

Copy #5 561

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT
#50

Do Not Fill In

№ ~~104067~~

State Well No.

Other Well No.

(1) OWNER:

[redacted]Name Robert O. Reynolds

Address 10889 Wilshire Blvd.

Los Angeles, Calif. 90024

[redacted](2) LOCATION OF WELL:

[redacted]ounty Kern Owner's number, if any #1

Township, Range, and Section S/E¼ Sec. 4, T31S, R37-E

[redacted]istance from cities, roads, railroads, etc. 2740' east of w line of [redacted], 1320' no. of so. line of Sec. 4. (Cantil)

(3) TYPE OF WORK (check):

[redacted]ew Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐

[redacted] destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
[redacted]rigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:

[redacted] STEEL: OTHER:
[redacted]NGLE ☐ DOUBLE ☐

If gravel packed

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
[redacted]	903'	16"	.250"	26"	0'	950'
[redacted]						

[redacted]ut shoe or well ring: Size of gravel:

Describe joint

[redacted] PERFORATIONS OR SCREEN:

[redacted] of perforation or name of screen Mill Cut

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
[redacted]	903'	12	2	2½" x .140"
[redacted]				
[redacted]				

[redacted] CONSTRUCTION:

[redacted] surface sanitary seal provided? Yes ☐ No ☒ To what depth ft.

[redacted] ere any strata sealed against pollution? Yes ☐ No ☒ If yes, note depth of strata

From ft. to ft.

[redacted] ft. to ft.

Method of sealing

(9) WATER LEVELS:

[redacted]at which water was first found, if known ~~XXXX~~ ft. 245 ft.

[redacted] level before perforating, if known ft.

Standing level after perforating and developing ft.

[redacted] WELL TESTS:

[redacted]mp test made? Yes ☒ No ☐ If yes, by whom? Rottman Drlg.

Yield: gal./min. with ft. drawdown after hrs.

[redacted]ature of water Was a chemical analysis made? Yes ☐ No ☒

[redacted]tric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:

Total depth 950' ft. Depth of completed well 903' ft.

Formation: Describe by color, character, size of material, and structure

ft.		to ft.	
0'	-	8'	Top Soil
8'	-	22'	Small to med. boulders or cobbles
22'	-	40'	Coarse sand & small gravel
40'	-	100'	Small boulders & gravel
100'	-	180'	Medium sand & small gravel
180'	-	280'	Hard packed sand or sandstone
280'	-	380'	Hard packed sand or sandstone
380'	-	480'	Hard packed sand or sandstone
480'	-	580'	Hard packed sand or sandstone
580'	-	654'	Hard packed sand or sandstone
654'	-	684'	Medium sand with clay streaks
684'	-	935'	Medium to coarse sand with clay
935'	-	950'	Hard packed sand

"Water Performance"

1800 GPM	@	253'
2000 GPM	@	254'
2400 GPM	@	255'
2800 GPM	@	256'
3200 GPM	@	257'
3600 GPM	@	260'
4200 GPM	@	265'

Work started 5/16/73 19 . Completed 6/15/ 19 73

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Rottman Drilling Co.
(Person, firm, or corporation) (Typed or printed)

Address 121 West Ave. I

Lancaster, Calif. 93534

[SIGNED] /sig/ F. Rottman
(Well Driller)

License No. 117561 Dated 6/15/73, 19

SKETCH LOCATION OF WELL ON REVERSE SIDE

#49

ORIGINAL
File with DWR

SEP 31 1974

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

#48

Do Not Fill In

№ 82587

State Well No. 31S/37E-

Other Well No.

(1) OWNER:

Name Robert C. Reynolds
Address 10580 Wilshire Blvd.
Los Angeles, Calif. 90024

(2) LOCATION OF WELL:

County Kern — Owner's number, if any
Township, Range, and Section Sec. 8, T31S, R37E
Distance from cities, roads, railroads, etc. approx. 2 miles south of Jawbone Canyon Cafe, Cantil.

(3) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:

STEEL: OTHER:
SINGLE ☐ DOUBLE ☐

If gravel packed

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	813'	16"	1/4"	26"	0	813'

Size of shoe or well ring: — Size of gravel: 1/4"
Describe joint Welded

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen [illegible] Cut

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
233'	813'	12	2	2-1/2" x 1/4"

(8) CONSTRUCTION:

Was a surface sanitary seal provided? Yes ☐ No ☒ To what depth ft.
Were any strata sealed against pollution? Yes ☐ No ☐ If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing

(9) WATER LEVELS:

Depth at which water was first found, if known 260' ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing ft.

(10) WELL TESTS:

Furnished by
Was pump test made? Yes ☒ No ☐ If yes, by whom? Owner
gal./min. with ft. drawdown after hrs.
Temperature of water — Was a chemical analysis made? Yes ☐ No ☐
Was electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:

Total depth 904' ft. Depth of completed well 813' ft.
Formation: *Describe by color, character, size of material, and structure*

ft. to ft.	
0 - 14'	Loose gravel
14 - 42 '	Gravel boulders
42 - 233'	Coarse to medium sand
233' - 305'	Coarse gravel, coarse sand
305' - 468'	Medium to fine sand, streaks of boulders
468' - 602'	Coarse sand
602' - 708'	Medium sand, strks of gravel
708' - 813'	Medium to fine sand, strks of gravel, strks of boulders
813' - 904'	Fine hard sand

CONFIDENTIAL - NOT FOR PUBLIC RELEASE

"Water Performance"

Test Pump Dec. 20, 1973:

2000 GPM @ 272'
2400 GPM @ 274'
2600 GPM @ 276'
2800 GPM @ 277'
3000 GPM @ 278'
3300 GPM @ 279'

Retest Pump Dec. 31, 1973:

3200 GPM @ 279'
3300 GPM @ 280'
3500 GPM @ 283'
3700 GPM @ 285'

Work started Nov. 21, 1973 Completed Dec. 14 1973

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME ROTTMAN DRILLING CO.
(Person, firm, or corporation) (Typed or printed)
Address 121 W. Avenue I
Lancaster, Calif. 93534
[SIGNED] [signature] (Well Driller)
License No. 117561 Dated December 31, 1973

SKETCH LOCATION OF WELL ON REVERSE SIDE

11/14/94 15:43 ☎805 634 1428 KCWA ☑004/022

FEB 29 1976

#51

ORIGINAL
File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do Not Fill In

No 107088

State Well No. 31S/37E

Other Well No.

(1) OWNER:

[redacted]me Robert O. Reynolds (Fremont Valley Ranch)
Address Ste. 305, 11661 San Vincente Blvd.
Los Angeles, Calif. 90049

[redacted]) LOCATION OF WELL:

[redacted] Kern Owner's number, if any

Township, Range, and Section NW¼NW¼ Sec. 4, T31S, R37E MDBM

[redacted]ance from cities, roads, railroads, etc. Cantil area, approx. 1 3/4 mi. west of Neuralia Rd.; approx. 1 mi. south of SPRR

(3) TYPE OF WORK (check):

[redacted]w Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐

[redacted]estruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
[redacted]igation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:

[redacted] X STEEL: OTHER:
[redacted]NGLE ☐ DOUBLE ☐

If gravel packed

[redacted]From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0'	785'	16"	1/4"	26"	0'	785'

[redacted] of shoe or well ring: Size of gravel: #4

Describe joint: Welded

[redacted]) PERFORATIONS OR SCREEN:

[redacted]e of perforation or name of screen Mill Cut

[redacted]From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
295'	785'	12	2	2½" x 140"

[redacted]) CONSTRUCTION:

[redacted]a surface sanitary seal provided? Yes ☐ No ☒ To what depth ft.

Were any strata sealed against pollution? Yes ☐ No ☐ If yes, note depth of strata

From ft. to ft.

[redacted] ft. to ft.

Method of sealing

(9) WATER LEVELS:

[redacted]th at which water was first found, if known 185' ft.

[redacted]ding level before perforating, if known ft.

Standing level after perforating and developing ft.

[redacted]) WELL TESTS:

[redacted]ump test made? Yes ☒ No ☐ If yes, by whom? Owner Furnished

[redacted]: gal./min. with ft. drawdown after hrs.

[redacted]emperature of water Was a chemical analysis made? Yes ☐ No ☒

[redacted] electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:

Total depth 785' ft. Depth of completed well 785' ft.

Formation: *Describe by color, character, size of material, and structure*

ft. to ft.

0' - 8' Top Soil
8' - 36' Small boulders
36' - 60' Coarse sand with clay
65' - 110' Medium sand with clay strks
110' - 160' Coarse sand
160' - 180' Small gravel & clay
180' - 260' Medium sand with clay strks
260' - 400' Medium sand and clay
400' - 590' Medium sand with clay strks
590' - 640' Medium sand
640' - 780' Medium sand with clay
780' - 785' Bedrock

CONFIDENTIAL - NOT FOR PUBLIC RELEASE

"Water Performance"

1000 GPM @ 210'
1400 GPM @ 225'
1800 GPM @ 230'
2200 GPM @ 240'
2600 GPM @ 252'
2800 GPM @ 275'

Work started 1/29/76 Completed 2/16/76

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME ROTTMAN DRILLING CO.
(Person, firm, or corporation) (Typed or printed)

Address 121 W. Avenue I, Lancaster, Ca. 93531

[SIGNED] [signature]
(Well Driller)

License No. C117561 Dated November 17, 1976

SKETCH LOCATION OF WELL ON REVERSE SIDE

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

DUPLICATE
Retain this copy

WATER WELL DRILLERS REPORT

Do Not Fill In

№ 82572

State Well No.
Other Well No.

Domestic Well — Domestic (in Farm yard)

(1) OWNER:

Name Robert O. Reynolds
Address 10889 Wilshire Blvd.
Los Angeles, Calif. 90024

(2) LOCATION OF WELL:

County Kern — Owner's number, if any
Township, Range, and Section T-31-S R-37-E Sec. 8
Distance from cities, roads, railroads, etc.

(3) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:

STEEL: OTHER:
SINGLE ☐ DOUBLE ☐

If gravel packed

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	505	12"	1/4"	22"	455	505

Size of shoe or well ring: — Size of gravel: No. 4
Describe joint Welded

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen Mill Cut

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
220	505	12	2	2½ x .140

(8) CONSTRUCTION:

Was a surface sanitary seal provided? Yes ☒ No ☐ To what depth 50 ft.
Were any strata sealed against pollution? Yes ☐ No ☐ If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing Cement top 50'

(9) WATER LEVELS:

Depth at which water was first found, if known 190' ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing ft.

(10) WELL TESTS:

Was pump test made? Yes ☒ No ☐ If yes, by whom? Rottman Drilling Co.
Yield: gal./min. with ft. drawdown after hrs.
Temperature of water — Was a chemical analysis made? Yes ☐ No ☒
Was electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:

Total depth ft. Depth of completed well 505 ft.
Formation: *Describe by color, character, size of material, and structure*
ft. to ft.

0 - 7	Surface soil, sandy
7 - 65	Coarse sand & boulders
65 -120	Boulders, coarse sand & gravel, small layers of clay
120 -180	Coarse sand, gravel & boulders
180 -220	Medium to coarse sand, small gravel & small clay streaks
220 -250	Medium to coarse sand
250 -280	Coarse sand, small amount of clay
280 -380	Coarse sand, layers of brown silt, small boulders
380 -470	Coarse sand & gravel, small layers sandy clay & boulders
470 -505	Medium to coarse sand (firm)

"WATER PERFORMANCE"

1100 GPM	@ 205'
800 GPM	@ 202'
600 GPM	@ 196'
400 GPM	@ 193'

Work started 8/8 19 73, Completed 8/15 19 73

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Rottman Drilling Co.
(Person, firm, or corporation) (Typed or printed)
Address 121 W. Avenue I
Lancaster, Calif. 93534
[SIGNED] F. Rottman
(Well Driller)
License No. 117561 Dated August 31, 19 73

SKETCH LOCATION OF WELL ON REVERSE SIDE

Test Hole

V

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

DUPLICATE
Retain this copy

Phase II

Abandon ~~renamed "abandoned" Well # of Phase 2~~

Do Not Fill In
№ 78351
State Well No.
Other Well No.

(1) OWNER: NO ASSIGNED #
Name Robert O. Reynolds
Address 10889 Wilshire Blvd.
Los Angeles, Calif. 90024

(2) LOCATION OF WELL:
County Kern Owner's number, if any NA
Township, Range, and Section SE ¼ Sec. 8, T31S,R37E
Distance from cities, roads, railroads, etc. approx. 2 mi. south of Jawbone Canyon Cafe, Cantil area.

(3) TYPE OF WORK (check): *NW¼ of SE¼ of 8
New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:
X STEEL: OTHER:
SINGLE ☐ DOUBLE ☐

If gravel packed

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	600'	16"	3/16"	26"	0	600'

Size of shoe or well ring: Size of gravel: #4
Describe joint Welded

(7) PERFORATIONS OR SCREEN:
Type of perforation or name of screen Mill Cut

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
240'	600'	12	2	2½" x .140

(8) CONSTRUCTION:
Was a surface sanitary seal provided? Yes ☐ No ☒ To what depth ft.
Were any strata sealed against pollution? Yes ☐ No ☐ If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing

(9) WATER LEVELS:
Depth at which water was first found, if known 220' ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing ft.

(10) WELL TESTS:
Was pump test made? Yes ☒ No ☐ If yes, by whom? Owner furnished.
Yield: gal./min. with ft. drawdown after hrs.
Temperature of water Was a chemical analysis made? Yes ☐ No ☐
Was electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:
Total depth 600 ft. ft. Depth of completed well 600 ft.
Formation: Describe by color, character, size of material, and structure

ft. to ft.		
0' - 14'	Coarse sand, gravel
14' - 74'	Coarse sand
74' - 127'	Gravel, coarse sand
127' - 234'	Coarse to medium sand, strks of gravel
234' - 324'	Medium to fine sand, strks of gravel
324' - 402'	Gravel, coarse sand, medium sand
402' - 528'	Medium sand, strks of gravel, strks of fine sand
528' - 596'	Medium to coarse sand, strks medium sand
596' - 600'	Hard fine sand, boulders

"Water Performance"
~~50 to 150 GPM @ 380 to 440 ft.~~

Work started 12/14/ 19 73. Completed 1/21 19 74

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Rottman Drilling Co.
(Person, firm, or corporation) (Typed or printed)
Address 121 W. Avenue I
Lancaster, Calif. 93534
[SIGNED]
(Well Driller)
License No. 117561 Dated Jan. 25 19 74

SKETCH LOCATION OF WELL ON REVERSE SIDE

DWR 188 (REV. 9-68) Possible to be abandoned ... [illegible]

25179-950 9-68 50M TRIP △ OSP

12/14/04 10:46 800 004 1420 K C W A 012/022

63

ORIGINAL
File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

Do not fill i

No. 067827

State Well No. 31S/37E-8

Other Well No.

Notice of Intent No.

Permit No. or Date 0709-2-17-81

(1) OWNER: Name Frank Arciero & Robt. O. Reynolds
Address 11661 San Vicente Blvd. Suite 306
City Los Angeles, Ca. Zip 90049

(2) LOCATION OF WELL (See instructions):
County Kern Owner's Well Number
Well address if different from above Fremont Valley Ranch-Cantil
Township T31S Range R37E Section 8
Distance from cities, roads, railroads, fences, etc.
NE¼ of NE¼ of Sec. 8

WELL LOCATION SKETCH
N
300'

(3) TYPE OF WORK:
New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☒
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other ☐

(5) EQUIPMENT:
Rotary ☒ Reverse ☐
Cable ☐ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☒ No ☐ Size
Diameter of bore 30" to 930; 22" 930-1730
Packed from 0 to 1730 ft.

(7) CASING INSTALLED:
Steel ☒ Plastic ☐ Concrete ☐

(8) PERFORATIONS: Mill Cut
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall
0	908	18	.250
908	1730	12 3/4	.250

From ft.	To ft.	Slot size
657	1730	.125x12½

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☐ No ☒ If yes, to depth ft.
Were strata sealed against pollution? Yes ☐ No ☒ Interval ft.
Method of sealing

(10) WATER LEVELS:
Depth of first water, if known 404 ft.
Standing level after well completion 404 ft.

(11) WELL TESTS:
Was well test made? Yes ☒ No ☐ If yes, by whom? Roscoe Moss
Type of test Pump ☒ Bailer ☐ Air lift ☐
Depth to water at start of test 435 ft. At end of test 404 ft.
Discharge 4000 gal/min after 5 hours Water temperature
Chemical analysis made? Yes ☒ No ☐ If yes, by whom? B.C. Labs
Was electric log made? Yes ☒ No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth 1740 ft. Depth of completed well 1730 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	135	Fine to Med. Sand W/20% Gravel
135	145	Fine to Med. Sand W/Boulders
145	225	Boulders & Coarse Sand
225	270	Boulders W/ Fine to coarse sand
270	350	Fine to Med. Sand W/Several clay Lenses
350	415	Sand & Clay Mixture-20% clay
415	430	Sand, Gravel W/50% Clay lenses
430	465	Sand & Gravel
465	520	20% Sand, 50% Clay 30% Gravel
520	565	Sand & Gravel W/Clay Lenses
565	620	Sand & Gravel
620	675	Brown Clay W/20% Fine Sand
675	735	Sand & Gravel W/Clay Lenses
735	793	Fine to Med. Sand W/Brn. Clay Lens
793	826	Hard Packed Sand
826	850	Sand-Gravel W/10% Clay
850	940	Sand & Gravel
940	970	Sand-Gravel-Hard Spots
970	1048	Hard Packed Sand
1048	1110	Sand & Gravel
1110	1160	Hard Packed Sand-Gravel
1160	1190	Sand & Gravel
1190	1220	Sand & Gravel W/Clay lenses
1220	1300	Sand & Gravel
1300	1365	Red & White Sand & Gravel
1365	1399	50% Clay 50% Sand
1399	1491	Med. to coarse sand-very little c
1491	1553	70% Clay 30% Sand
1553	1612	Dry clay W/20% Fine Sand
1612	1684	Coarse sand (well rounded)
1684	1720	Med Sand W/40-60% Clay
1720	1740	Med. Sand W/clay streaks

GPM	PUMPING LEVEL	YIELD
4000	441	102.5
3000	432	100.3
2000	423	97.6
1500	416	107

Work started 2-13-81 19 Completed 3-30 1981

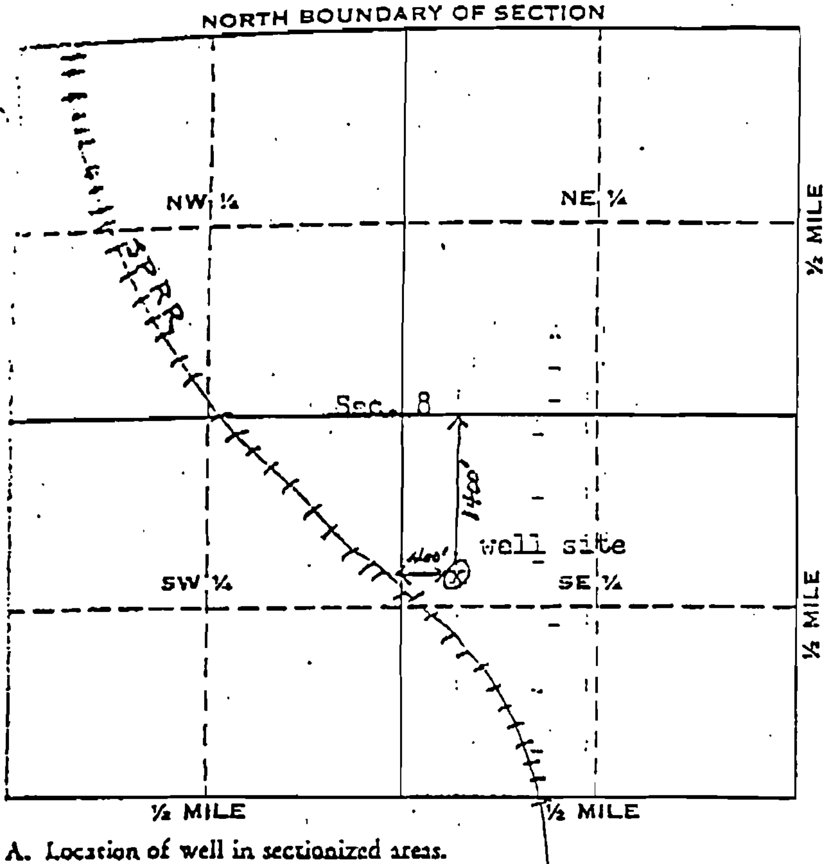
WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signed [signature] (Well Driller)

Name Rottman Drilling Co.
(Person, firm, or corporation) (Typed or printed)
Address 121 West Avenue I
City Lancaster, Ca. Zip 93534
License No. 316599 Date of this report 4-22-81

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

WELL LOCATION SKETCH



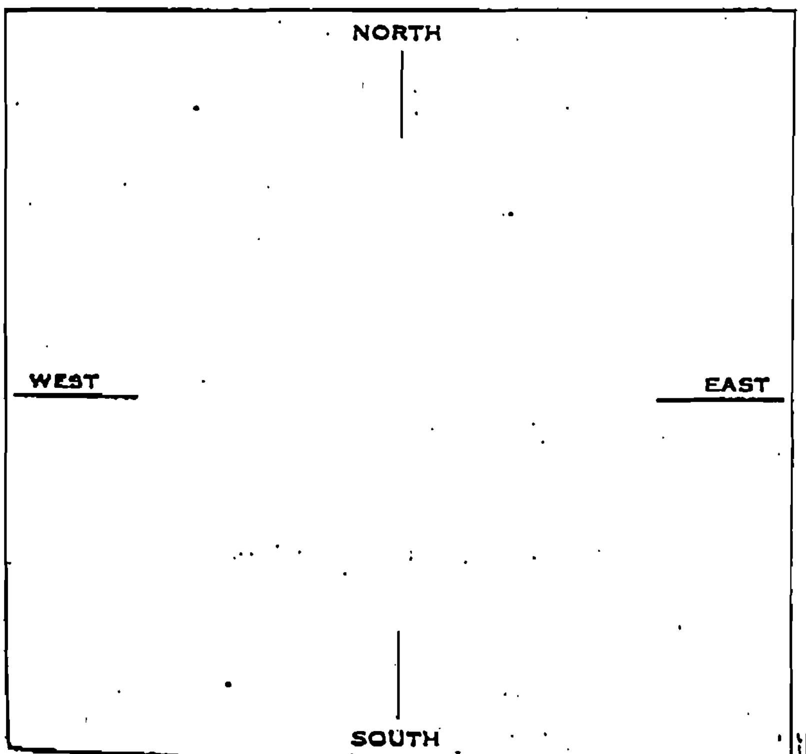
A. Location of well in sectionized areas.
Sketch roads, railroads, streams, or other features as necessary.

Township T 31S N/S

Range R37E E/W

Section No. SE¼ of Sec. 8

In Kern County, Cantil area, approx 2 miles south of Jawbone Canyon Cafe.



B. Location of well in areas not sectionized.
Sketch roads, railroads, streams, or other features as necessary.
Indicate distances.

ORIGINAL
File with DWR BA-0712

JUN 30 1979

31S/37E-4

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in

No. 22139

Notice of Intent No. 172168

Permit No. or Date 4-25-79

State Well No. 31S/37E-4N

Other Well No.

(1) OWNER: Name Freemont Valley Ranch
Address P.O. Box 1525
City Cantil, CA Zip 93519

(2) LOCATION OF WELL (See instructions):
County Kern Owner's Well Number 45A
Well address if different from above
Township 31S Range 37E Section 4
Distance from cities, roads, railroads, fences, etc. 4 miles north of Phillips Rd. 1 mile east of Highway 14.

WELL LOCATION SKETCH: SEC 4; 300X

(3) TYPE OF WORK:
New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☒
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other ☐

(5) EQUIPMENT:
Rotary ☐ Reverse ☒
Cable ☐ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☐ No ☒ Size Birdseye
Diameter of bore 28
Packed from 706 to surface

(7) CASING INSTALLED:
Steel ☒ Plastic ☐ Concrete ☐

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	380	16	.250	398	700	3/32
380	398	comp. sec.				

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☐ No ☒ If yes, to depth ___ ft.
Were strata sealed against pollution? Yes ☐ No ☒ Interval ___ ft.
Method of sealing

(10) WATER LEVELS:
Depth of first water, if known ___ ft.
Standing level after well completion 308 ft.

(11) WELL TESTS:
Was well test made? Yes ☐ No ☐ If yes, by whom?
Type of test Pump ☐ Bailer ☐ Air lift ☐
Depth to water at start of test ___ ft. At end of test ___ ft
Discharge ___ gal/min after ___ hours Water temperature
Chemical analysis made? Yes ☐ No ☐ If yes, by whom?
Was electric log made? Yes ☒ No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth ___ ft. Depth of completed well ___ ft.

from ft. to ft.	Formation (Describe by color, character, size or material)
0-40	Sand
40-60	Sand and brown clay
60-80	Gravel and med. sand
80-120	Brown clay and sand
120-160	Rock sand and gravel
160-170	Brown Clay
170-230	Rock, sand and gravel
230-250	Brown clay and sand
250-270	Rock and sand
270-290	Brown Clay
290-370	Brown Clay and sand
370-430	Rock and sand
430-450	Brown clay and sand
450-530	Med. size sand
530-540	Brown Clay
540-610	Med. size sand
610-640	Brown Clay
640-650	Sand and brown clay
650-706	Med. size sand

Work started ___ 19__ Completed ___ 19__

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED ______ (Well Driller)

NAME BAKERSFIELD WELL AND PUMP COMPANY
(Person, firm, or corporation) (Typed or printed)
Address P.O. BOX 3216
City BAKERSFIELD, CA Zip 93385
License No. 250368 Date of this report 5-11-79

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

DUPLICATE
Retain this copy

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do Not Fill In
№ 82564
State Well No.
Other Well No.

(1) OWNER:

Name Robert O. Reynolds
Address 10889 Wilshire Blvd.
Los Angeles, Calif. 90024

(2) LOCATION OF WELL:

County Kern Owner's number, if any
Township, Range, and Section N/~~W~~¼ of Sec. 9 T-31-S R-37-E
Distance from cities, roads, railroads, etc. 41
3/4 mile East of Well No. ~~[illegible]~~

(3) TYPE OF WORK (check):

New Well ☐ Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:

STEEL: OTHER:
SINGLE ☐ DOUBLE ☐

If gravel packed

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
				12½"		

Size of shoe or well ring: Size of gravel:
Describe joint

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.

(8) CONSTRUCTION:

Was a surface sanitary seal provided? Yes ☐ No ☐ To what depth ft.
Were any strata sealed against pollution? Yes ☐ No ☐ If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing

(9) WATER LEVELS:

Depth at which water was first found, if known ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing ft.

(10) WELL TESTS:

Was pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Temperature of water Was a chemical analysis made? Yes ☐ No ☐
Was electric log made of well? Yes ☐ No ☐ If yes, attach copy

(11) WELL LOG:

Total depth ft. Depth of completed well Test hole 608 ft.
Formation: Describe by color, character, size of material, and structure
ft. to ft.

0 - 33 Hard silt, small amt of clay
33 - 45 Boulders & coarse sand
45 - 205 Small streaks of silt, boulders coarse sand
205 - 220 Med. to coarse sand, small clay streaks
220 - 250 Med. to coarse sand & boulders (hard)
250 - 405 Hard sand, small layers of hard dry clay
405 - 452 Hard dry sandy clay
452 - 473 Hard sand, small amount blue clay
473 - 478 Hard sand
478 - 486 Blue clay, coarse sand
486 - 590 Decomposed rock
590 - 608 Granite

Test hole only

Work started 6/27 1973. Completed 7/2 1973

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Rottman Drilling Co.
(Person, firm, or corporation) (Typed or printed)
Address 121 W. Avenue I
Lancaster, Calif. 93534
[SIGNED] F. Rottman
(Well Driller)
License No. 117561 Dated July 5 1973

SKETCH LOCATION OF WELL ON REVERSE SIDE

DUPLICATE
Retain this copy

Possible #40

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Unknown # & location

Do Not Fill In

№ 82566

State Well No. ______

Other Well No. ______

(1) OWNER:

Name Robert O. Reynolds

Address 10889 Wilshire Blvd.
Los Angeles, Calif. 90024

(2) LOCATION OF WELL:

County Kern Owner's number, if any

Township, Range, and Section T-31-S R-37-E Sec. 9

Distance from cities, roads, railroads, etc. NW1/4 - NW1/4 - 9

(3) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐

If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:

STEEL: OTHER:
SINGLE ☐ DOUBLE ☐

If gravel packed

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	604	16"	1/4"	26"	0	604

Size of shoe or well ring: Size of gravel: No. 4

Describe joint Welded

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen Mill Cut

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
260	604	16	2	2½" x .140

(8) CONSTRUCTION:

Was a surface sanitary seal provided? Yes ☐ No ☐ To what depth ft.

Were any strata sealed against pollution? Yes ☐ No ☐ If yes, note depth of strata

From ft. to ft.

From ft. to ft.

Method of sealing

(9) WATER LEVELS:

Depth at which water was first found, if known 185 ft.

Standing level before perforating, if known ft.

Standing level after perforating and developing ft.

(10) WELL TESTS:

Was pump test made? Yes ☒ No ☐ If yes, by whom? Rottman Drilling Co.

Yield: 800 gal./min. with 400 ft. drawdown after 18 hrs.

Temperature of water Was a chemical analysis made? Yes ☐ No ☒

Was electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:

Total depth 617 ft. Depth of completed well 604 ft.

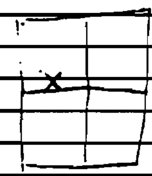
Formation: *Describe by color, character, size of material, and structure*

ft. to ft.

0 - 28	Silt & sand
28 - 120	Sandy clay & silt
120 - 165	Boulders, sandy clay & silt
165 - 245	Medium to coarse sand & clay streaks
245 - 465	Boulders, fine to medium sand, small streaks of clay
465 - 495	Sandy clay
495 - 525	Firm, fine to medium sand, small clay streaks
525 - 602	Hard sand
602 - 617	Rock

"WATER PERFORMANCE"
800 GPM @ 400'

(Lots of air)



Shown on health dept permit

Work started 7/10 1973. Completed 7/19 1973

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Rottman Drilling Co.
(Person, firm, or corporation) (*Typed or printed*)

Address 121 W. Avenue I
Lancaster, Calif. 93534

[SIGNED] T. Rottman (Well Driller)

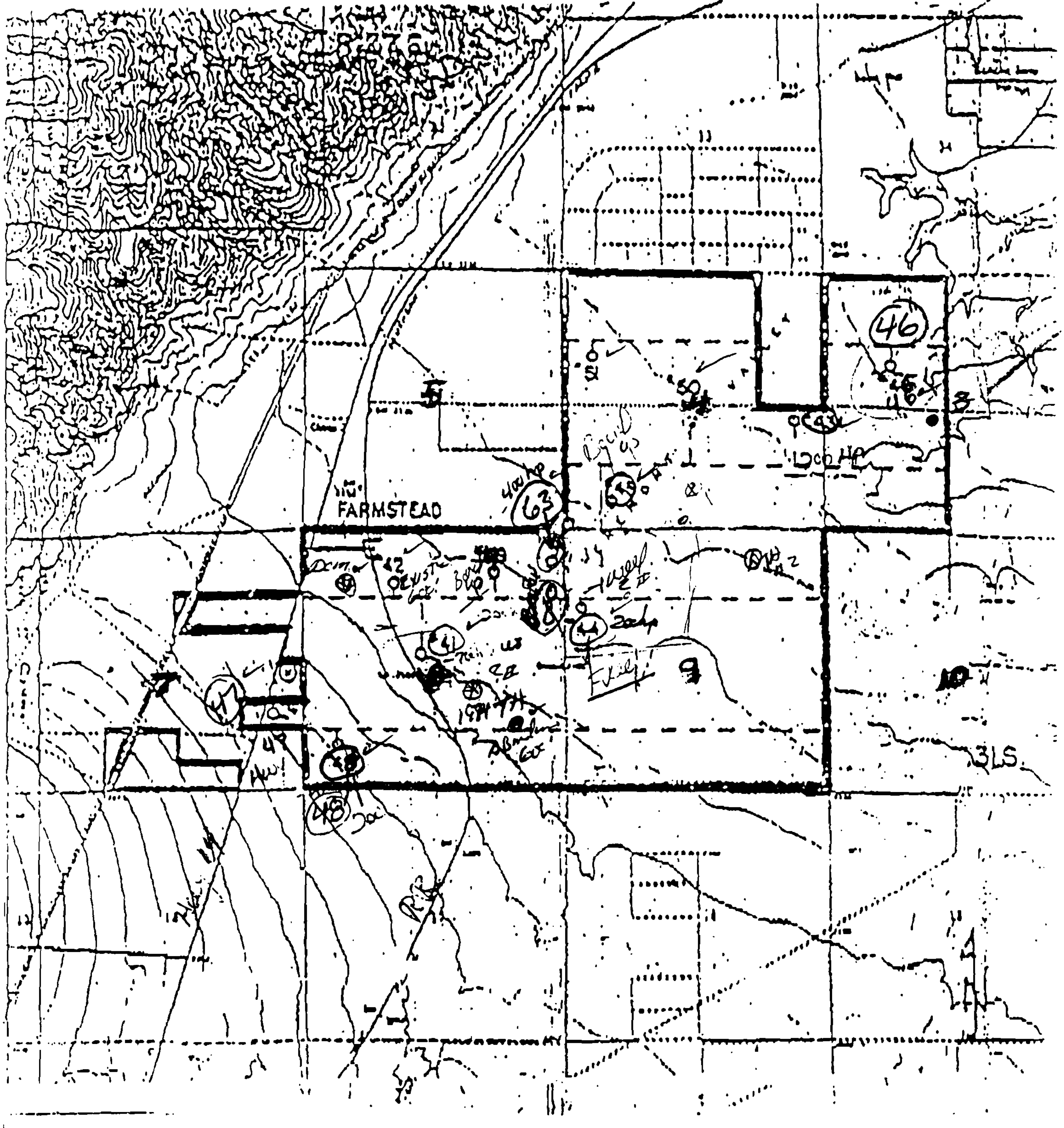
License No. 117561 Dated July 23, 1973

SKETCH LOCATION OF WELL ON REVERSE SIDE

DWR 188 (REV. 9-68)

25179-950 9-68 50M TRIP ΔD OSP

[redacted]



Seal 418' TD 494'

47 Seal 491' TD 1109 810'

Free

No clutch or Key

ATTACHMENT "A"
RANCH 2270
REEMONT VALLEY

ROTTMAN DRILLING
WELL LOG

#1

Owner

Mailing Address

Well Location

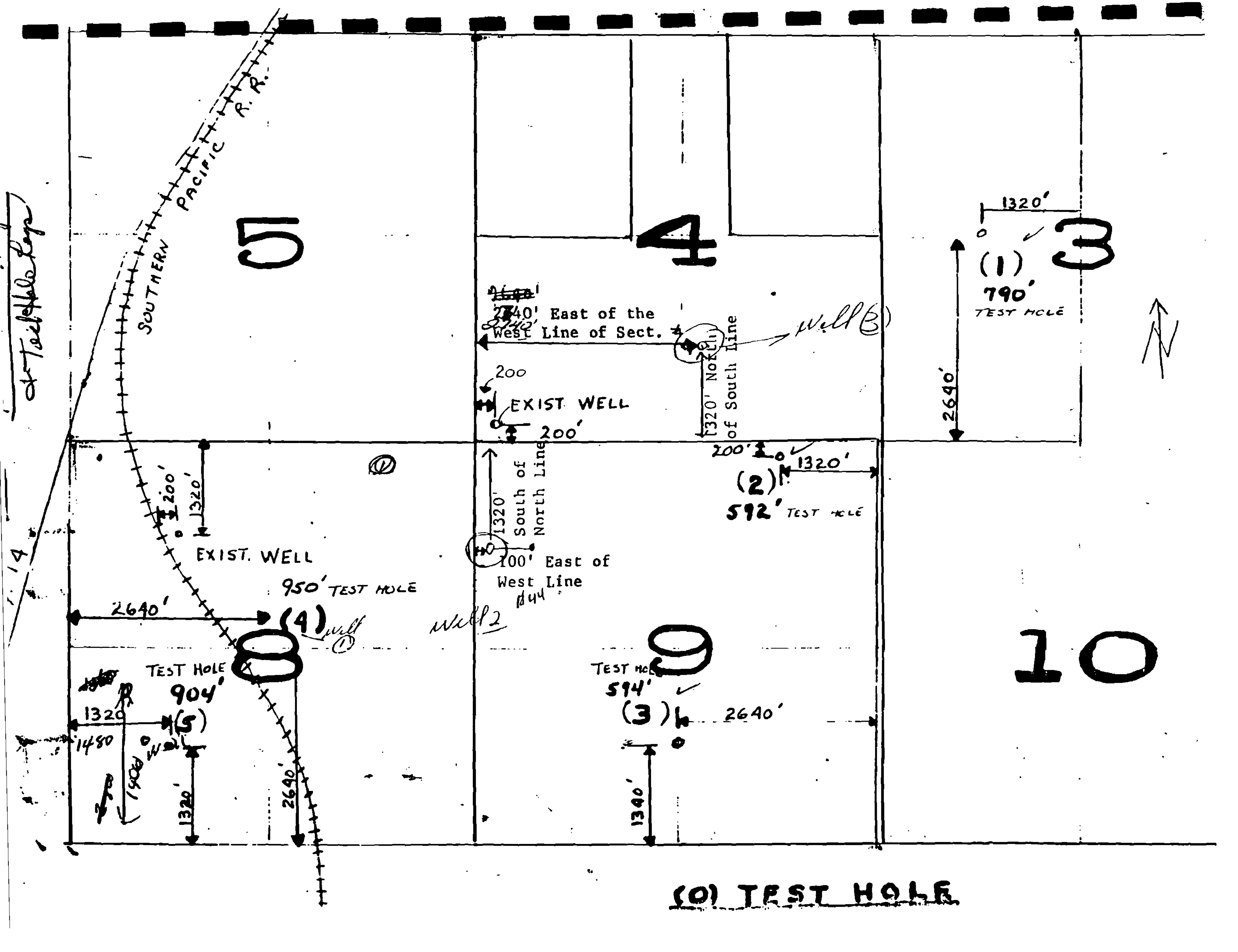
Size of Hole 7 7/8" Size of Casing Thickness of Casing Depth of Well 790'

Feet Solid Casing Test hole No. I. Water Level ________ Feet

Feet Perf. Casing Performance

2:00 P
Work Started 4/3/93 Work Completed 4-4-93 Driller

1	31.4	31.4	0 - 8'	TOP SOIL
2	25	56.6	8' - 72'	MED SAND
1	32.2	88.8	72 - 140'	MED TO COARSE SAND + GRAVEL
2	31.6	120.2	140' - 240'	BLUE CLAY + MED SAND
3	32.5	152.7	240 - 280'	CLAY + MED SAND
4	31.9	184.4	280 - 310'	CLAY + MED SAND
5	32.2	216.4	310 - 340'	CLAY + MED SAND
6	32.2	248.8	340 - 370	CLAY + MED SAND
7	31.5	280.1	370 - 400	MED SAND WITH SMALL CLAY
8	30	310	400 - 500'	MED SAND
9	32	342	560 - 580'	BLUE CLAY + SAND
10	31.5	373	580 - 660	MED SAND.
11	31.2	404	660 - 710'	MED SAND + CLAY
12	31.9	435.9	710 - 790'	MED SAND WITH SMALL CLAY STKS
13	31.3	467		
14	31	498		
15	30.7	528.7		
16	31.10	560.4		
17	31.7	592.1		
18	32	624		
19	30	654		
20	30.4	684.4		
21	30.5	714.9		
22	30.9	745		
23	30.4	775		
		[illegible]	KELLY [illegible] 790'	


SOUTHERN PACIFIC R.R.
5
4
3
8
9
10
2740' East of the West Line of Sect.
Well (3)
1320' North of South Line
200
EXIST WELL
200'
1320'
(1)
790'
TEST HOLE
2640'
200'
1320'
(2)
592' TEST HOLE
1320' South of North Line
100' East of West Line
#44
EXIST. WELL
1320'
200
950' TEST HOLE
2640'
(4) well (1)
well 2
TEST HOLE
904'
1320
1480
(5)
1400 well
1320
2640'
TEST HOLE
594'
(3)
2640'
1340'
14
(O) TEST HOLE

ROTTMAN DRILLING
WELL LOG

#3 hole

Owner

Mailing Address

Well Location

Size of Hole Size of Casing Thickness of Casing Depth of Well 594'

Feet Solid Casing Test hole # III 3 Water Level ________ Feet

Feet Perf. Casing Performance

Work Started 4-11-73 Work Completed Driller

31.4	31.6	0 - 5'	SURFACE SAND
25'	56.6	5 - 9'	CLAY
32.2	88.8	9 - 28'	COARSE SAND
31.6	120.2	28 - 55	SMALL TO MED COBBLES
32.5	152.7	55 - 100'	MED TO COARSE SAND
31.9	184.4	100 - 112'	LARGE GRAVEL (LOST
32.2	216.4		CIRCULATION)
32.2	248.8	112 - 180'	MED TO COARSE SAND
31.3	280.	180 - 216'	MED SAND
30'	310.	216 - 248	CLAY
32	342.	248 - 280	MED SAND with clay STKS.
31.5	373	280 - 340'	COARSE SAND
31.2	404	340 - 370	MED SAND
31.9	435.9	370 - 404	HARD DRY CLAY
31.5	467	404 - 498	COARSE SAND with CLAY STKS.
31	498	498 - 528'	MED SAND
30.9	528.9	528 - 560'	FINE HARD PACKED SAND
31.0	560.4	560 - 594	BED ROCK
31.9	5. 594.		
32			

ROTTMAN DRILLING
WELL LOG

#9 Log

Owner

Mailing Address

Well Location

Size of Hole 7 5/8" Size of Casing Thickness of Casing Depth of Well 592'

Feet Solid Casing Test Hole #II Water Level ______ Feet

Feet Perf. Casing Performance

Work Started 4-5-73 Work Completed 4-10-73 Driller

	31-6	31-6	0 - 10'	Surface sand
2	25-	56-6	10-28'	Coarse sand + small gravel.
	32-2	88-8	28-35'	Small boulders
	31-6	120-2	35-100' (A)	Small gravel + sand
	32-5	152-7	100-120'	Coarse sand
	31-9	184.4	120-150'	Small gravel with clay streaks
	32-2	216-4	150-200'	Coarse sand + clay
	32-2	248-8	200-290	Med sand
7	31-5	280-	290-370'	Small gravel with clay str.
	30	310	370-410'	Med sand with small clay st.
9	32	342	410-440'	Small gravel
	31-5	373	440-530	Med to coarse sand
11	31-2	404	530-560'	Med sand
	31-9	435-9	560-590'	Bed rock
13	31-3	467		
	31	498		
	30-7	528-7		(A) Lost circulation.)
	31-10	650 560-4		
	31-9	592-1	592	
18	32	624		
	30	654		
20	30-4			
	30-5			
2	30-7			
	30-4			

705
248
855
903

ROTTMAN DRILLING

WELL LOG

#4 [illegible] well #1

Owner

Mailing Address

Well Location

Size of Hole 26 Size of Casing 16 Thickness of Casing 1/4 Depth of Well 950'

Feet Solid Casing first hole [illegible] 248 Water Level ______ Feet

Feet Perf. Casing 855 Performance 4200 GPM

Work Started 4/19/[illegible] Work Completed 4/27/23 Driller

31-4	31-4	0 - 8'			TOP SOIL
25	56-4	8-22.			SMALL TO MED BOULDERS OR
32-2	88-8				COBBLES.
31-6	120-2	22-40'			COARSE SAND + SMALL GRAVEL
32-5	152-7	40-100'			SMALL BOULDERS + GRAVEL
31 7	184	100-180'			MED SAND + SMALL GRAVEL
32-2	216-4	180 - 280'			HARD PACKED SAND OR SAND-
32-2	248-8				STONE.
31-5	280	280 - 380'			" "
30	310				
32	342	380 - 480'			" "
31-6	373				
31-2	404	480 - 580'			" "
31-9	435-9				
31-2	467	580 - 654			" "
31	498	654' - 684'			MED SAND with CLAY STKS.
30-7	528-9	684 - 935			MED TO COARSE SAND with CLAY.
31-11	560-4	935 - 950'			HARD PACKED SAND
31-9	594				
32	624	24	304	805.	
30	654	25	322	837.2	
30-4	684	26	304	867	
30-5	714	27	327	900.1	
30-4	745	KELLY	35	935	
30-4	775				

ROTTMAN DRILLING #5 drill

WELL LOG

Owner

Mailing Address

Well Location

Size of Hole | Size of Casing | Thickness of Casing | Depth of Well 904

Feet Solid Casing TEST HOLE NO 5 | Water Level ______ Feet

Feet Perf. Casing | Performance

Work Started 4/28/73 | Work Completed | Driller

1	31-6	21-6	0 - 2'	TOP SOIL
2	45	66	2 - 30'	MED BOULDERS + SAND
1	32-2	88-8	30 - 90'	MED TO COARSE SAND WITH SILT
2	31-6	120-2	90 - 140'	MED GRAVEL
3	32-5	152-7	140 - 160'	MED SAND WITH CLAY STKS
4	31-9	184	160 - 200'	MED SAND
5	32-2	216-4	200 - 280'	MED TO COARSE SAND
6	32-2	248-6	280 - 714	HARD PACKED SAND WITH SMALL
7	31-3	280		CLAY STKS AT 700'
8	30	310	714 - 885'	MED SAND
9	32	342	885 - 904	BED ROCK
10	31-5	373		
11	31-2	404		
12	31-9	435.9		
13	31-3	467		
14	31	498	24 · 30-4 · 806	
15	30.7	528-9	25 · 32-2 · 837	
16	31-10	560-4	26 · 30-4 · 867	
17	31-9	594	KELLY 35 · 904	
18	32	624		
19	30	654		
	30-4	684		
	30-5	714		
	30-4	745		
	30-4	775		

APPENDIX B
SECTIONS FROM REFERENCED REPORTS

GROUND WATER IN THE KOEHN LAKE AREA, KERN COUNTY, CALIFORNIA

By J. H. Koehler

ABSTRACT

Hydrologic characteristics of the Koehn Lake area were investigated determine the effects of external stresses on the system. Unconsolidated ›osits are more than 900 feet thick in the central part of the basin. ıtil Valley fault, in the central part of the basin, acts as a barrier to : flow of ground water.

Average annual recharge to aquifers from percolation of surface water and ›m underflow, between 1958 and 1976, was 10,200 acre-feet. Average annual ısumptive use, between 1960 and 1976, was 32,000 acre-feet, 21,800 acre-feet :e than the recharge, implying that average annual withdrawal from storage about 22,000 acre-feet. Storage depletion in 1976 was 50,000 acre-feet, ısiderably higher than the average. The cumulative storage depletion has ısed a decline in water levels and a pumping depression about 5 miles ıthwest of Koehn Lake.

Ground water in storage in 1976 was about 4 million acre-feet, and ground :er in storage above the 500-foot depth excluding the saline water under :hn Lake was about 2 million acre-feet.

Water samples were collected from 24 wells for chemical analysis. ıparison of analyses made during this study with historical water-quality ılyses indicated no significant change. A recent reversal in ground-water ıdient southwest of Koehn Lake may allow the saline water below Koehn Lake invade the fresh-water aquifer.

INTRODUCTION

Purpose and Scope

Residents of the Koehn Lake area (fig. 1) depend entirely on ground water for their water supply. Increased withdrawal of ground water for agricultural expansion has resulted in declining water levels in wells. The declining water levels have caused concern about the possibility of saline water from under Koehn Lake being drawn into and degrading the water supply.

The purposes of this study were (1) to define the current and historical ground-water conditions in order to describe the magnitude and distribution of the potential water-quantity and water-quality problems, and (2) to define changes and trends in the hydrologic system sufficiently that reasonable estimates of future effects can be made by local management agencies.

Data from a well inventory made in 1958 were published in California Department of Water Resources Bulletin 91-16 (Moyle, 1969). Since 1963, a monitoring program has furnished annual water-level data on 13 wells and water-quality data on 5 wells in the study area (fig. 2). These data, however, are not sufficient to determine the magnitude and areal distribution of changes in water levels and water quality caused by increased pumping.

Ground-water data obtained since 1958 by well drillers, pump companies, and other agencies were collected and correlated with wells in the field. The water level in all accessible wells was measured, and these data were used to draw a current (1976) water-level contour map. Water-level data from Moyle (1969) were used to draw a water-level contour map for 1958. These maps were compared to define the change of ground water in storage and the change in ground-water gradient resulting from increased pumpage.

Specific yield and thickness of the unconsolidated deposits were estimated from drillers' logs and were used to calculate the quantity of water in storage.

Consumptive use was calculated on the basis of types and areas of irrigated crops, taking into account the effect of local climatic conditions on applied water requirements.

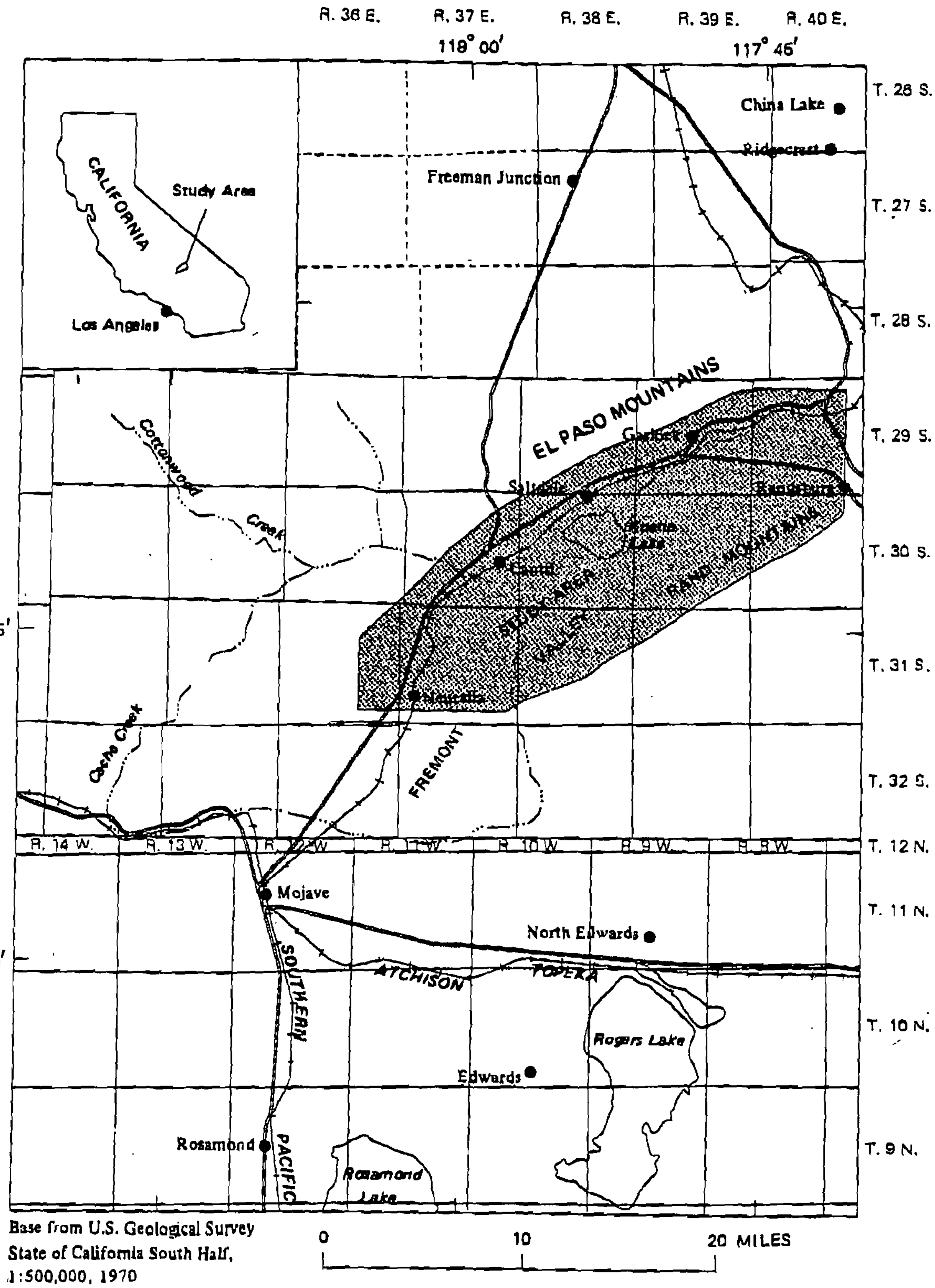


FIGURE 1.--Index map.

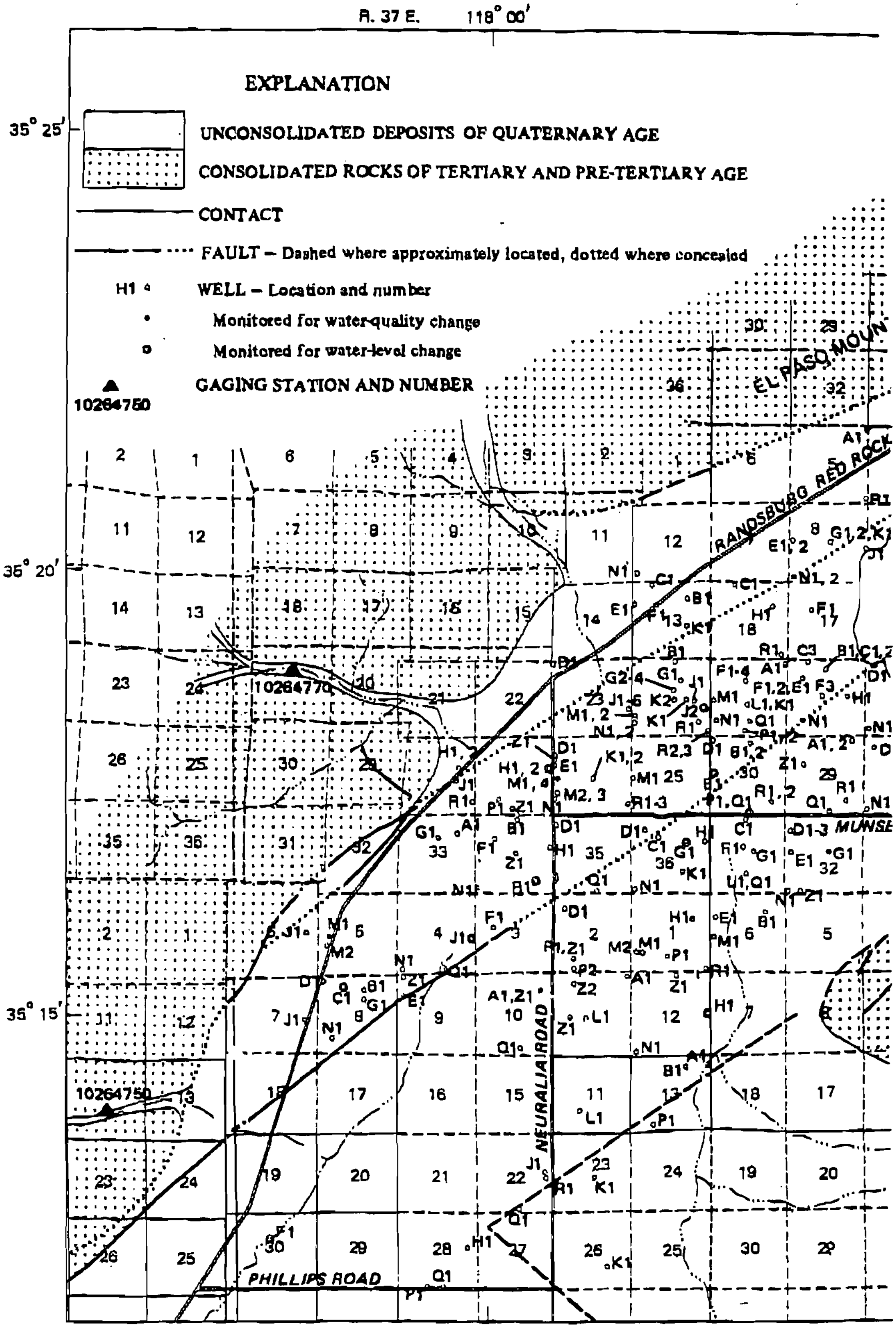
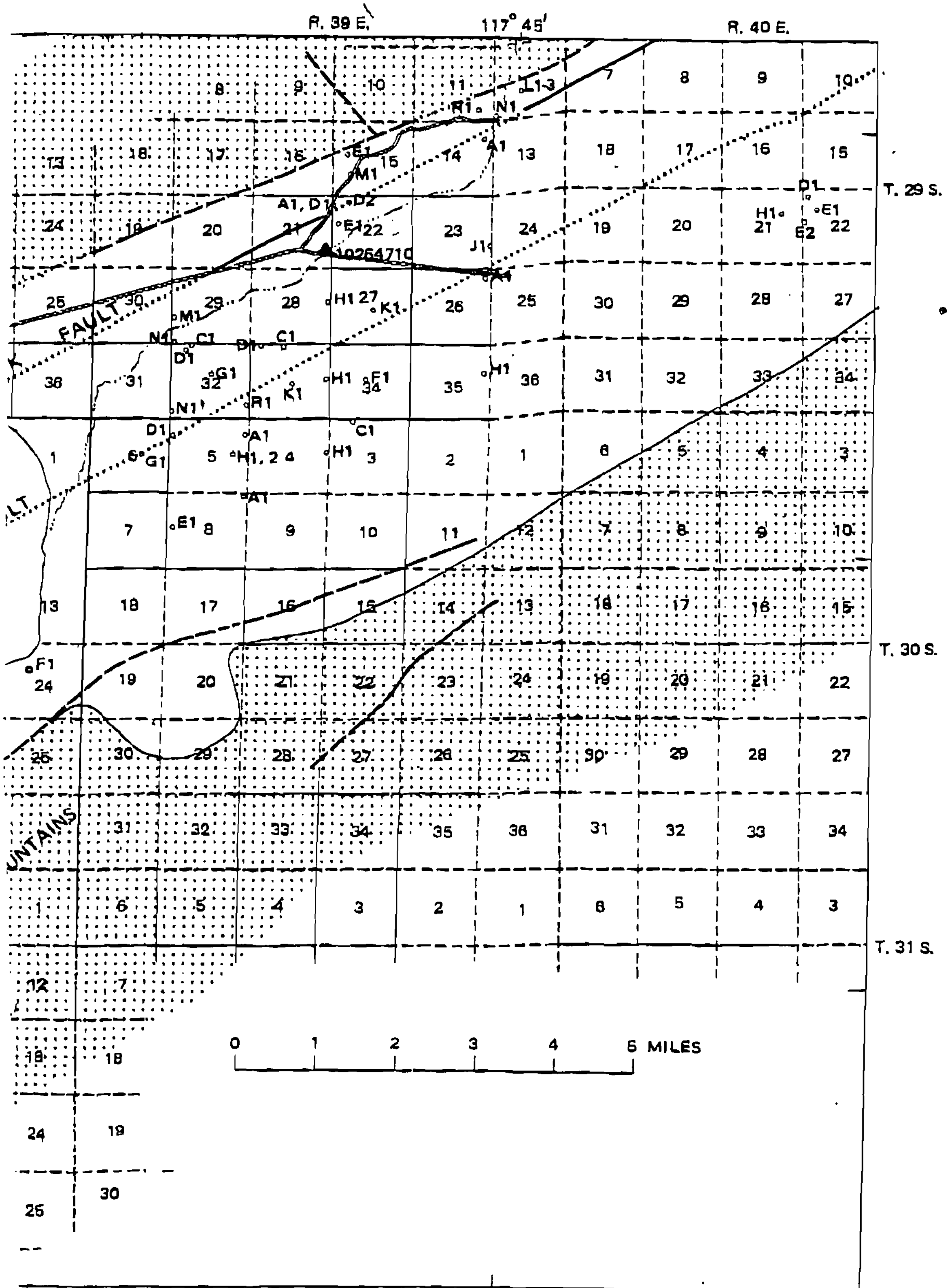


FIGURE 2.--Location of wells.

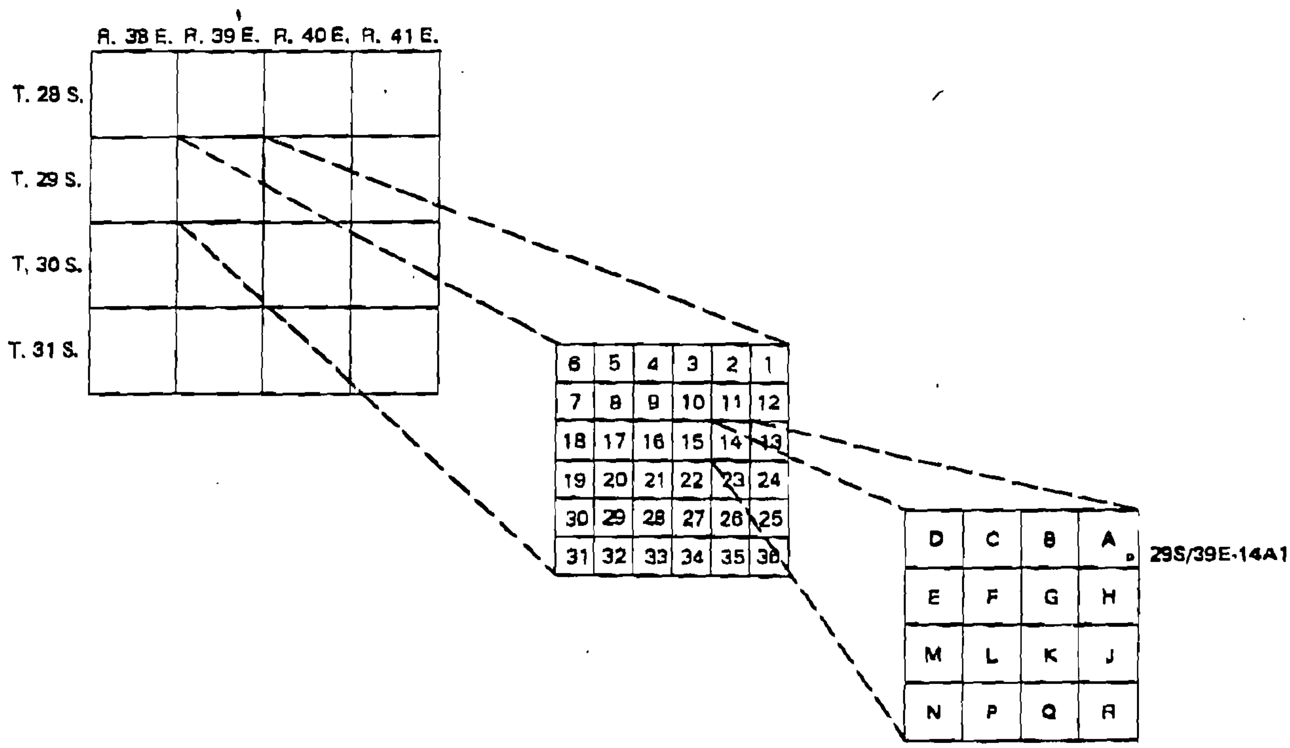


Geology generalized from W.R. Moyle, Jr., 1969

FIGURE 2.--Continued.

Well-Numbering System

Wells are numbered according to their location in the rectangular system for subdivision of public land. As shown by the diagram, that part of the number preceding the slash, as in 29S/39E-14A1, indicates the township (T. 29 S.); the number following the slash indicates the range (R. 39 E.); the number following the hyphen indicates the section (sec. 14); the letter following the section number indicates the 40-acre subdivision according to the lettered diagram below. The final digit is a serial number for wells in each 40-acre subdivision. A Z before the final digit would indicate that the well is plotted from an unverified location description; the site was visited but no evidence of a well could be found. All wells mentioned in this report are in the southeast quadrant of the Mount Diablo base line and meridian.



HYDROLOGY

Lithology

The lithology of the study area, for the purpose of this report, is divided into two units, consolidated rocks and unconsolidated deposits (fig. 2

Consolidated rocks consist of igneous and metamorphic rocks of pre-Tertiary age, which make up the basement complex, and sedimentary and volcanic rocks of Tertiary age. Sedimentary rocks are composed of conglomerat sandstone, and clay interbedded with lava flows and other volcanic rocks. The thickness of the Tertiary rocks in the central part of the basin is not known; however, an oil-test well (30S/38E-19P2) drilled to a depth of 5,065 ft did not reach the basement complex.

Pre-Tertiary igneous and metamorphic rocks are impermeable except where weathered or fractured, and yield only small quantities of water to wells. Tertiary sedimentary rocks have a low permeability and yield little or no water to wells.

Unconsolidated deposits, of Quaternary age, are alluvial deposits consisting of gravel, sand, silt, clay, and some boulders. These deposits range from coarse and poorly sorted near the mountains to finer and better sorted near the central part of the basin. Sediments of Koehn Lake bed are mainly silt and clay.

Thickness of the unconsolidated deposits southwest of Koehn Lake (fig. 3) was determined by a subjective technique using data supplied from drillers' logs. Terms such as hard, firm, rocks, or granite were presumed to be the consolidated rocks. These data were supplemented by logs of wells that apparently did not reach the consolidated rocks. Thickness of the unconsolidated deposits exceeds 900 ft in the central part of the basin but is less than 400 ft in the vicinity of sec. 11, T. 31 S., R. 37 E.

Thickness of the unconsolidated deposits northeast of Koehn Lake could not be contoured because data were sparse or lacking. Wells 29S/39E-32D1 and 32N1 were drilled to depths of about 800 ft below land surface and did not encounter the consolidated rocks.

The permeability of the unconsolidated deposits varies with the texture of the sediments. Aquifers of well-sorted sand and gravel yield large quantities of water to wells. Clay and mixtures of clay, sand, and gravel yield only small quantities of water to wells. Irrigation wells drilled in the unconsolidated deposits typically yield about 1,500 gallons of water per minute.

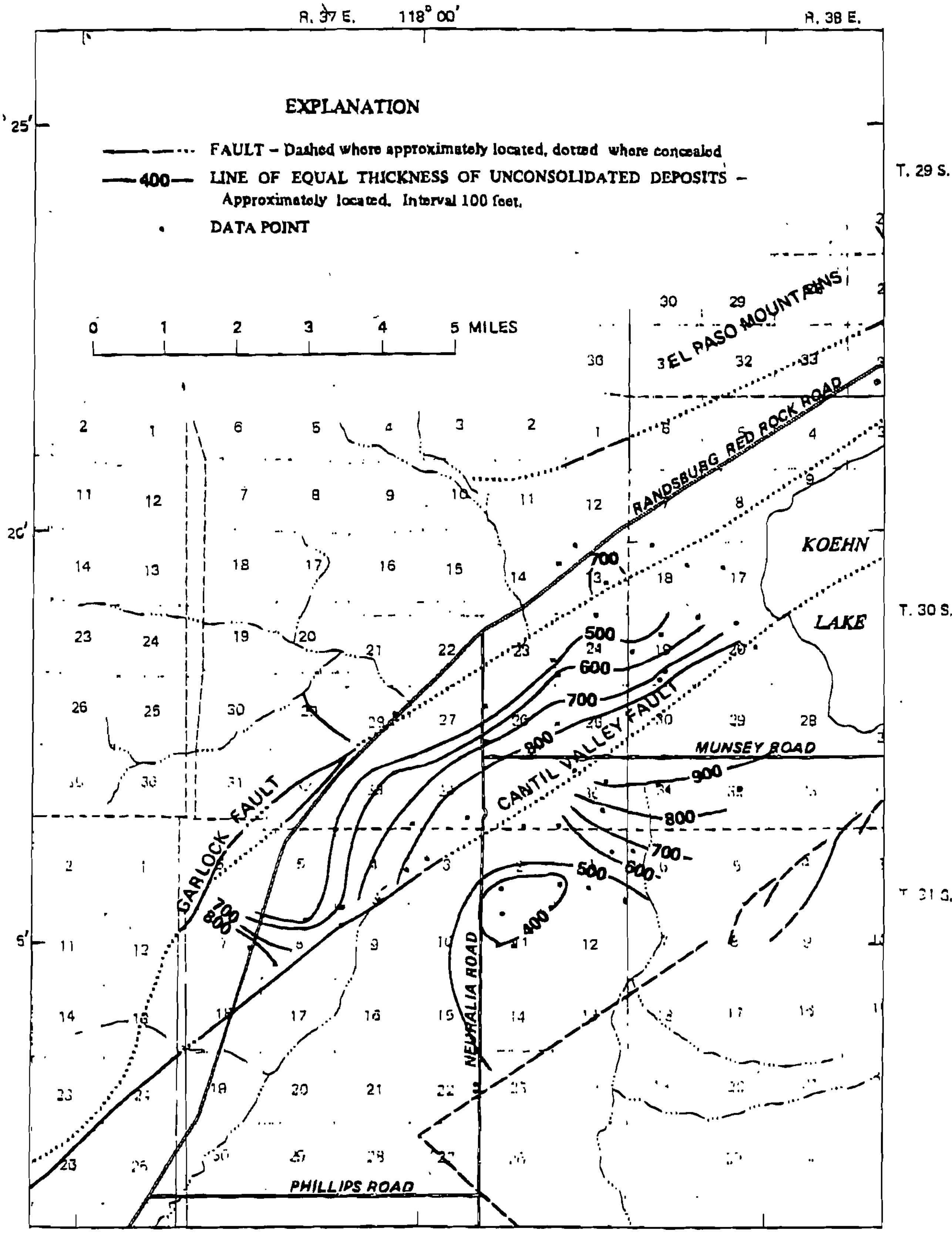


FIGURE 3.--Thickness of unconsolidated deposits.

Faults and Ground-Water Barriers

Four major faults traverse the project area in a northeast-trending direction (fig. 2): An unnamed fault near the base of the El Paso Mountains, the Garlock fault on the northwest side of the basin, the Cantil Valley fault near the center of the basin, and an unnamed fault near the base of the Rand Mountains. Cantil Valley fault is hydrologically the most significant because it acts as a barrier to ground-water movement. The barrier effect is most obvious southwest of Koehn Lake where there is a marked difference in water levels on opposite sides of the fault (figs. 4 and 5). The thickness of the unconsolidated deposits is less on the southeast side of the fault (fig. 3), which limits the transmitting capacity and quantity of water in storage in that part of the basin.

Occurrence and Movement of Ground Water

The water level in all accessible wells was measured in 1958 and 1976. These data were used to draw water-level contour maps for 1958 (fig. 4) and 1976 (fig. 5). In areas where differences in water levels existed because of well depth, the deeper water level was used for contouring.

The gap in water-level contours between the northeast and southwest sides of Koehn Lake on the 1958 map (fig. 4) is due to a lack of water-level data in that area. In 1958 ground water moved from all directions toward Koehn Lake. A small pumping depression developed about 5 mi southwest of Koehn Lake because of withdrawals for irrigation. Between the pumping depression and Koehn Lake a residual ground-water mound maintained a gradient toward Koehn Lake. Northeast of this residual mound water moved toward Koehn Lake.

Water-level contours for 1976 (fig. 5) show a much steeper gradient toward the pumping depression. Also it is larger and deeper, and the residual ground-water mound between the pumping depression and Koehn Lake is gone. Because the ground-water gradient is from Koehn Lake toward the pumping depression, saline water under Koehn Lake poses a potential threat to the fresh-water supply.

Figure 6 shows the net water-level decline between 1958 and 1976. A maximum decline of about 240 ft occurred in the pumping depression on the southeast side of Cantil Valley fault. Figure 7 contains hydrographs of selected wells showing the rate of water-level decline. The hydrograph of well 30S/37E-36G1 shows less water-level decline in the past 18 years than is indicated for the general area on the water-level decline map (fig. 6). This is probably because well 36G1 is shallower and not in hydraulic contact with the same aquifer as well 30S/37E-36H1 which was used for drawing the water-level decline map.

A multiple-aquifer\system is indicated by differences in the water level in neighboring wells. For example, the water-level altitude in wells 30S/38E-30Q1, 78 ft deep, 30P1, 330 ft deep, and 31C1, depth unknown, is 1,900, 1,851, and 1,830 ft, respectively. These wells are within 200 ft of each other. The water-level altitude in wells 30S/37E-36G1 and 36H1, about 1,000 ft apart, is 1,877 and 1,780 ft, respectively. The areal extent of the multiple-aquifer system is not known. Available water-level data suggest that the multiple-aquifer system may be limited to a small area southwest of Koehn Lake. Many multiple-piezometer test wells would be required to define the system accurately.

Recharge

Recharge to the aquifer has two sources, percolation of runoff from the mountains and underflow from the southwest.

Slightly more than 200 acre-ft per year of runoff has been monitored at three gaging stations (fig. 2) in the study area.

Station name and number	Location (township, range, and section)	Years monitored	Drainage area (mi^2)	Average annual runoff (acre-ft)
Goler Gulch near Randsburg, Calif. 10264710	29S/39E-21	1966-72	41.3	14
Pine Tree Creek near Mojave, Calif. 10264750	31S/36E-14	1958-continuing	33.5	152
Cottonwood Creek near Cantil, Calif. 10264770	30S/37E-19	1966-72	163	46
Total			237.8	212

By extrapolating for the remaining drainage area (about 200 mi^2), an additional unmonitored 200 acre-ft per year of runoff is estimated to flow into the study area. Most of the runoff is caused by infrequent summer thunderstorms in the El Paso Mountains. As the runoff migrates over the alluvial fans and valley floor, losses occur by evaporation, transpiration by vegetation, retention as soil moisture, and percolation to the water table. When runoff is intense, some of the water reaches Koehn Lake. Because the bed of Koehn Lake is nearly impermeable, most of that water is ponded and then lost by evaporation. It is estimated that of the total runoff only half, or about 200 acre-ft per year, is recharge to the ground water.

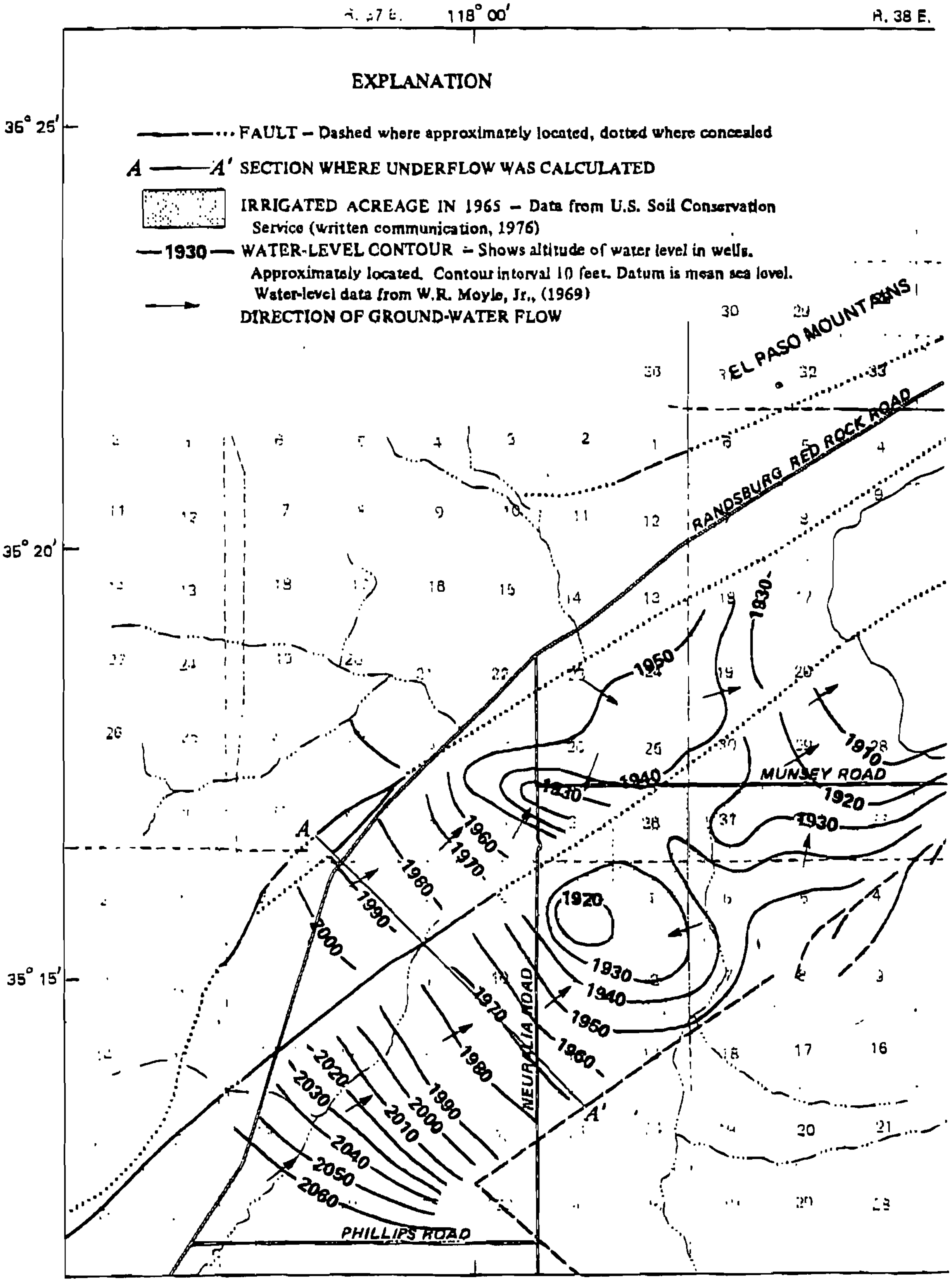


FIGURE 4.--Water-level contours for 1958.

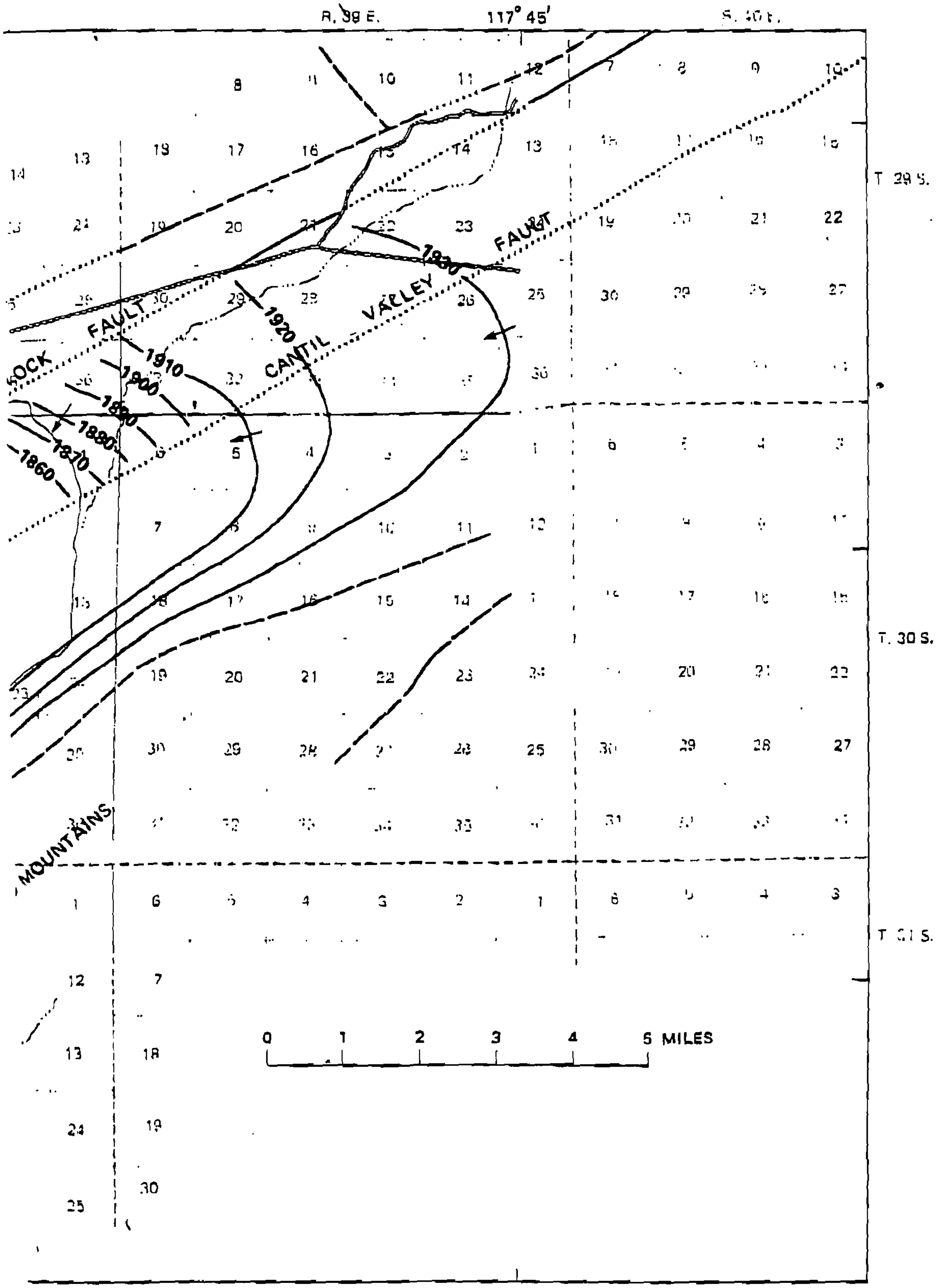


FIGURE 4.--Continued.

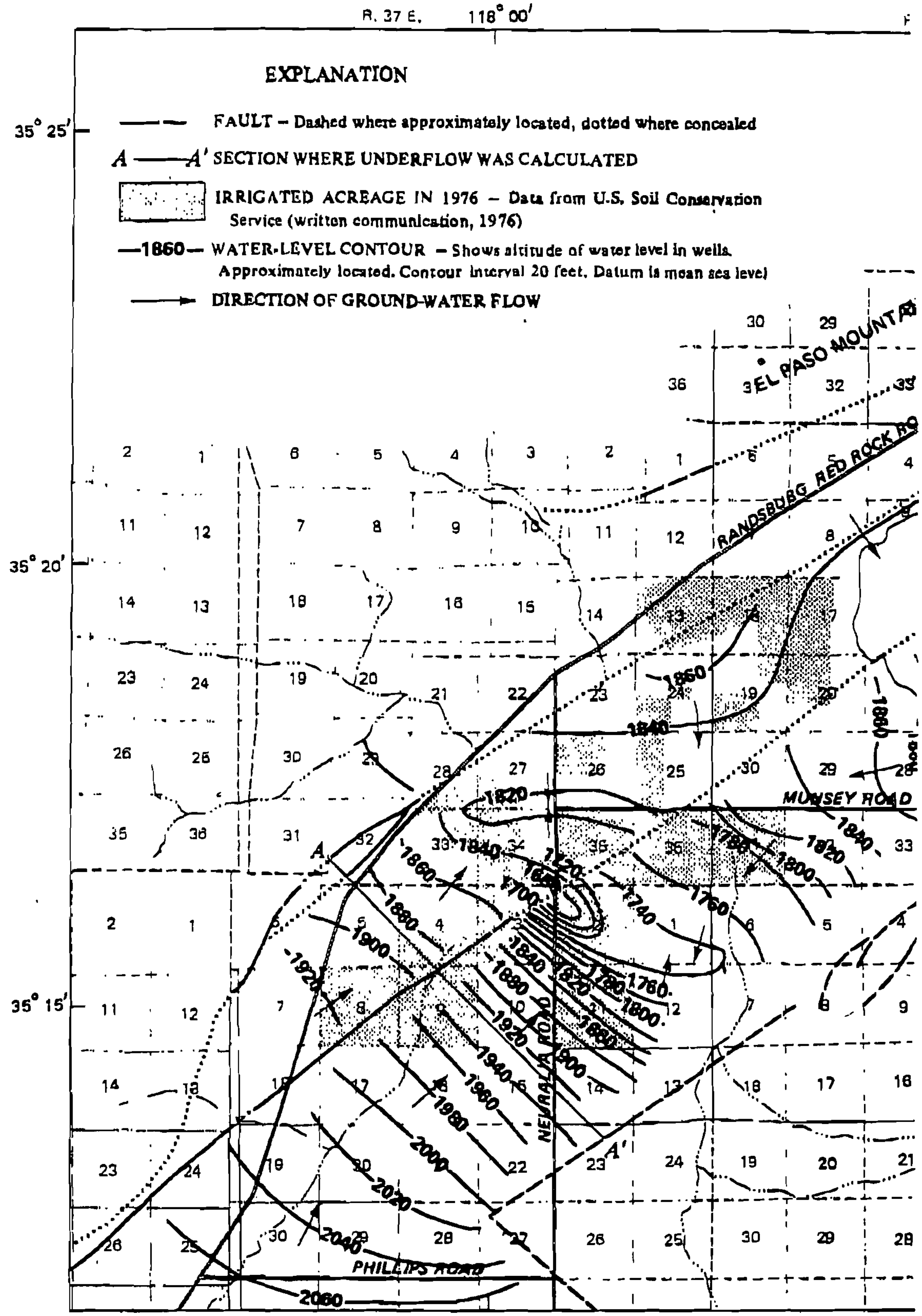


FIGURE 5.--Water-level contours for 1976.

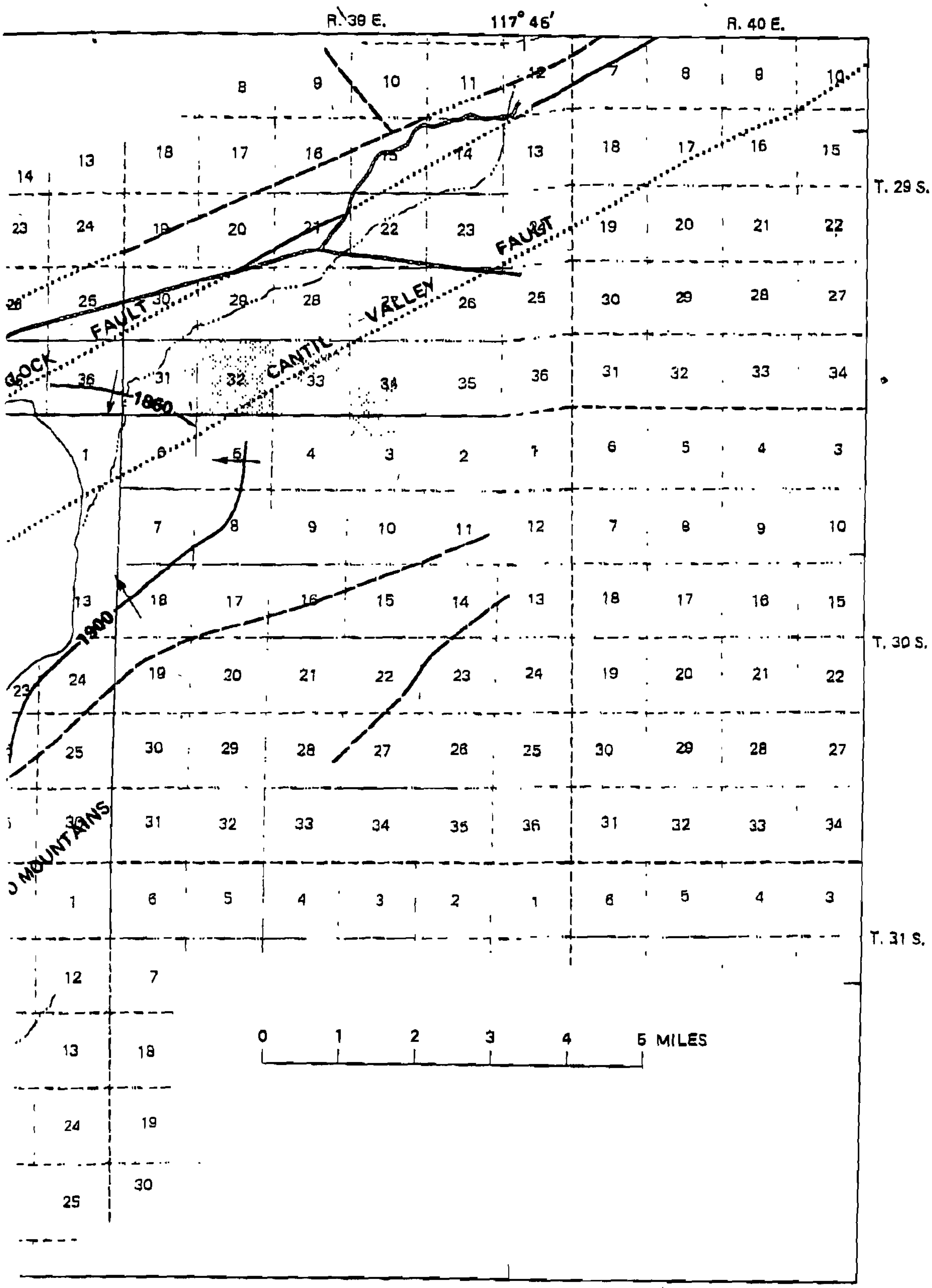


FIGURE 5.--Continued.

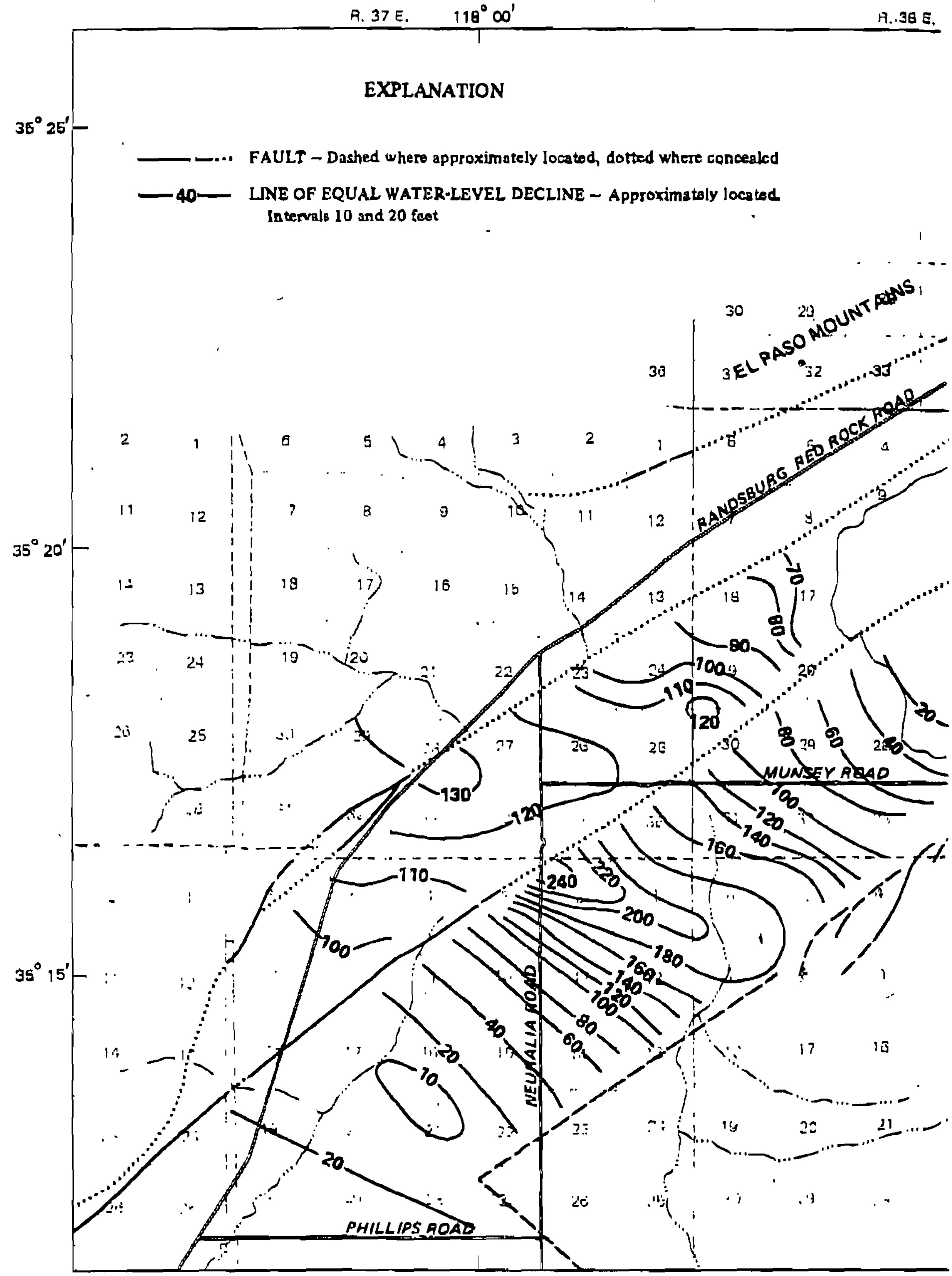


FIGURE 6.--Water-level decline between 1958 and 1976.

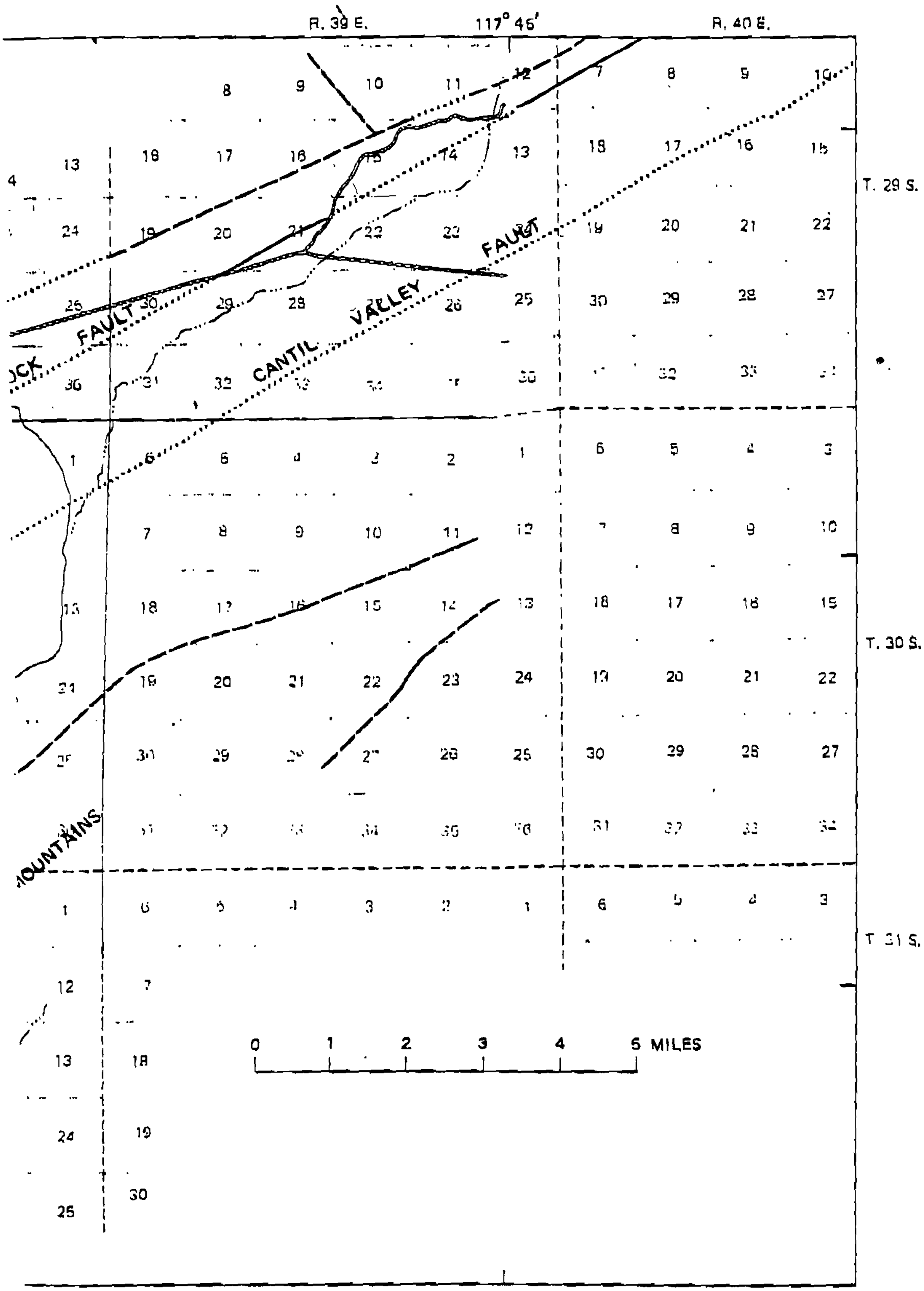


FIGURE 6.--Continued.

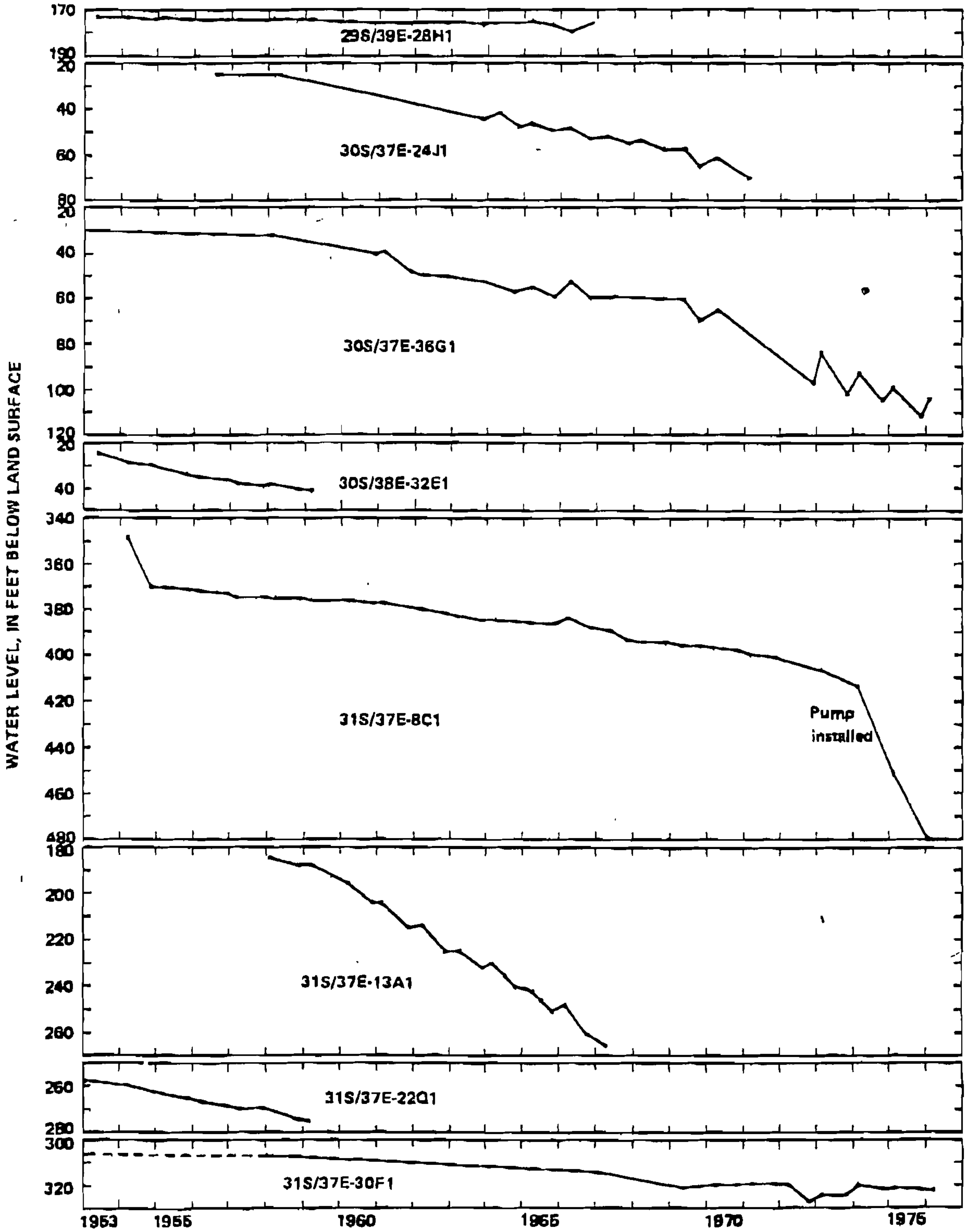


FIGURE 7.--Hydrographs of selected wells.

Underflow into the study area from the southwest was calculated using the following equation:

$$Q = 0.00838\ TIW$$

where Q = underflow, in acre-feet per year
0.00838 = constant factor to convert cubic feet per day to acre-feet per year
T = transmissivity, in feet squared per day
I = ground-water gradient, in feet per mile
W = width of aquifer, in miles.

Section A-A' (fig. 4) was chosen for the calculation of underflow ecause the water-level gradient is uniform and the flow of ground water is early parallel to the basin boundaries. The value for T was estimated using he relation: T = 270 times the average specific capacity of wells in the rea. Specific capacity is the discharge of a well, in gallons per minute, ivided by the drawdown in feet. Because of the different hydraulic haracteristics on the two sides of Cantil Valley fault, the basin was divided nto two parts. The value of T was estimated to be 20,000 ft^2/d on the orthwest side of the fault and 8,000 ft^2/d on the southeast side of the fault. he difference in values of T is largely because of the different thickness of lluvium in the basin on opposite sides of the fault (fig. 3). The annual nderflow was calculated to be at least 9,500 acre-ft under steady-state onditions.

Recharge occurs from underflow in the creek channels that emanate from he Rand Mountains. Permeability of the channel deposits, cross-sectional rea, and ground-water gradient were estimated, and it was calculated that 00 acre-ft per year of recharge occurs in this manner.

The area northeast of Koehn Lake does not receive any recharge from derflow and receives only a very small quantity from stream runoff; therefore, arly all the recharge is confined to the area southwest of Koehn Lake.

Total annual recharge to the basin is the sum of the infiltration from rface runoff (200 acre-ft), underflow at section A-A' (9,500 acre-ft), and derflow from the stream channels (500 acre-ft), or 10,200 acre-ft.

Discharge

Ground water in the study area is discharged naturally by evapotranspiration ly. Evapotranspiration is equivalent to consumptive use and is defined as conversion of water into vapor by transpiration and evaporation from etation and by direct evaporation from the soil or water surface.

Figures 4 and 5 show the location of irrigated acreage in 1965 and 1976, respectively. Irrigated acreage increased from 4,100 acres in 1965 to 9,900 acres in 1976. During this period, crop type shifted from a diversity of crops to alfalfa almost exclusively.

Consumptive use by irrigated crops was calculated from crop-type and acreage data obtained from the U.S. Soil Conservation Service (T. D. Cattron, written commun., 1976). Alfalfa, the principal crop in the study area, uses about 6.2 acre-ft of water per acre per year (T. D. Cattron, U.S. Soil Conservation Service, oral commun., October 1976). Annual consumptive use by other crops was computed using the following values: Cotton, 3.4 acre-ft; barley, 2.1 acre-ft; wheat, 1.9 acre-ft; and other, 2.5 acre-ft. Figure 8 shows the annual consumptive use from 1960 to 1976, with the exception of 1967 for which no acreage data are available. The average annual consumptive use by native vegetation, residents, livestock, and industry is estimated to be 500 acre-ft. Total consumptive use ranged from 18,500 acre-ft in 1960 to 60,000 acre-ft in 1976, an average of about 32,000 acre-ft per year. Average annual consumptive use exceeds recharge by 21,800 acre-ft; this water comes from storage.

Storage

As previously discussed, average ground-water discharge for the period 1960-76 exceeded recharge; the difference of 21,800 acre-ft per year came from storage.

As a check on the figures used for recharge and discharge, the storage depletion was calculated by a second method. This method is based on the assumption that the multiple-aquifer system is not extensive and that the decline in water level represents dewatered sediments.

The volume of dewatered sediments was multiplied by the specific yield of the sediments. The total volume of sediments dewatered southwest of Koehn Lake was estimated by the change in water level between 1958 and 1976 (fig. 6). The volume of sediments dewatered northeast of Koehn Lake was estimated based on the extrapolation of water-level change in four wells between 1958 and 1976.

Specific yield is defined as the percentage, by volume, of drainable pore spaces in the sediments. An average value for specific yield was estimated by the method described by Davis, Green, Olmsted, and Brown (1959). Eleven drillers' logs were selected on the basis of well location and succinctness of lithologic terms. Each lithologic unit was assigned a value for specific yield. The average specific yield is about 11 percent.

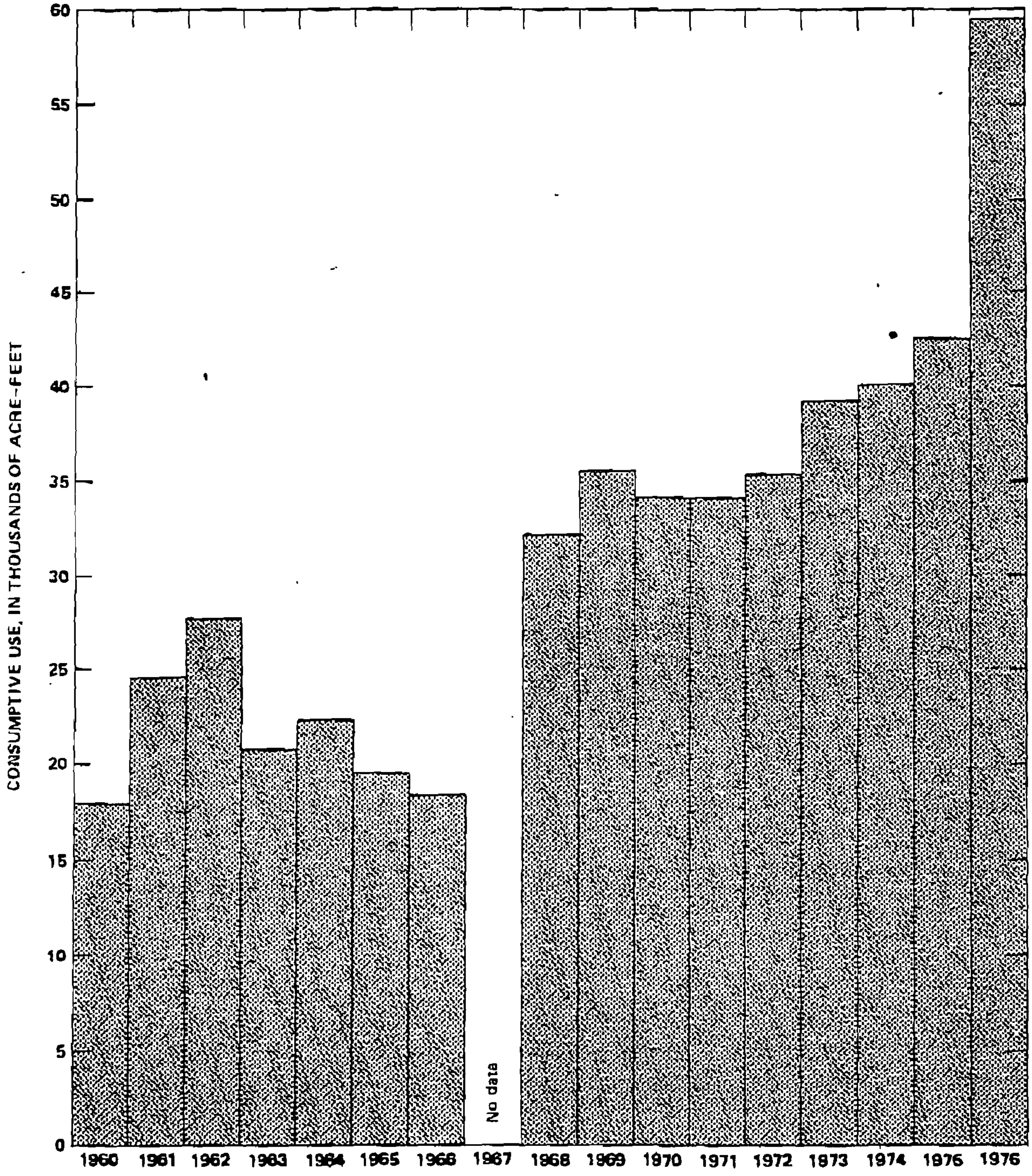


FIGURE 8.--Consumptive use by irrigated crops.

The total water taken from storage between 1958 and 1976 is about 365,000 acre-ft or about 20,000 acre-ft per year. This figure compares well with the previously computed average storage depletion of 21,800 acre-ft per year determined from consumptive-use data. If consumptive-use data are extrapolated to span the same time period (1958-76), then the average storage depletion would be about 20,000 acre-ft per year. The long-term averages do not reflect the recent increases in storage depletion. In 1976 the storage depletion was about 50,000 acre-ft; the increase is approximately proportional to the consumptive use.

Most of the storage depletion has occurred in the area of large water-level declines southwest of Koehn Lake (fig. 6). Northeast of Koehn Lake, irrigated acreage increased from 40 acres in 1965 to 360 acres in 1975 and to 1,000 acres in 1976. Nearly all the acreage is in alfalfa; therefore, about 6,000 acre-ft of water was consumptively used in 1976. Because there is little recharge to this part of the basin, nearly all the water comes from storage. Consequently, as agricultural development expands, the rate of water-level decline, per unit of consumptive use, will be greater than that for the area southwest of Koehn Lake.

The total volume of water in storage in the study area was estimated by assuming that the basin northeast of Koehn Lake is symmetrical. To determine total water in storage between the water table and the consolidated rocks, the volume of saturated sediments was multiplied by the specific yield of the sediments. Total ground water in storage in 1976 was 4.1 million acre-ft. Pumping water for agricultural use from a depth of more than 500 ft below land surface is generally considered uneconomical. Total water in storage above the 500-ft depth is 2.5 million acre-ft. About 0.4 million acre-ft of this is in storage below Koehn Lake. If we presume that this water is too high in dissolved solids for agricultural uses, then about 2 million acre-ft of usable water is in storage above the 500-ft depth.

CHEMICAL QUALITY OF GROUND WATER

Water samples were collected from 24 wells in 1976 for analysis of major chemical constituents. Trace elements were determined on four of the samples. Of the 24 wells sampled, 6 had been sampled in 1953 or 1965. A comparison of chemical constituents indicated no significant change in water quality.

The dissolved-solids concentration of the water from wells used for irrigating crops ranged from about 500 to 800 mg/L (milligrams per liter). Of the wells sampled, well 30S/38E-3B3, 200 ft deep, on the northwest side of Koehn Lake had the highest dissolved-solids concentration, 68,800 mg/L. A sample collected from well 30S/38E-3B1, 99 ft deep, in 1962 contained a dissolved-solids concentration of 101,000 mg/L (Moyle, 1969). Water from several wells in sec. 3 is pumped into evaporation ponds for the commercial production of sodium chloride (table salt).

High concentrations of dissolved solids exist in ground water under many dry lakes or playas such as Koehn Lake. This high concentration is caused by the evaporation of water from the surface and by vertical capillary movement and eventual evaporation of shallow ground water. The evaporating process concentrates the dissolved solids in the remaining water.

Water-quality data indicate that the water of poorest quality is presently limited to Koehn Lake and immediate area.

Stratification of ground water by quality is indicated by water samples collected from four wells augered at two sites. The dissolved-solids concentrations of samples from well 30S/38E-27M1, 121 ft deep, and well 27M2, 61 ft deep, were 883 and 1,520 mg/L, respectively. A similar stratification exists at the site of augered wells 30S/38E-28N1 and N2. In both examples, the water of poorest quality is nearer the surface; however, the opposite is true at wells 30S/38E-30P1, 332 ft deep, and 30Q1, 71 ft deep, with dissolved-solids concentration of 1,860 and 610 mg/L, respectively.

The different kinds of ground water probably are separated by lenses of relatively impermeable clay. These clay lenses may retard the movement of water of poor quality; however, as the ground-water gradient toward the pumping depression increases, the probability of degrading the fresh water increases. If agricultural development northeast of Koehn Lake continues, there is the probability of degrading the water in that area.

To accurately assess the areal and vertical extent and the rate of movement of the water of poor quality, an extensive water-quality monitoring program would be required. Several multiple-piezometer observation wells would aid in defining the vertical changes in water quality.

SUMMARY AND CONCLUSIONS

Recharge to ground water in the study area is about 10,000 acre-ft per year. Consumptive use ranged from 18,500 acre-ft in 1960 to 60,000 acre-ft in 1976, with an average of 32,000 acre-ft per year. This is an average annual storage depletion of about 22,000 acre-ft. This average does not reflect the recent increase in storage depletion. In 1976 the storage depletion was about 50,000 acre-ft. Total ground water in storage in 1976 was about 4 million acre-ft. Total water in storage, excluding the saline water below Koehn Lake, above the 500-ft depth is about 2 million acre-ft.

The storage depletion has caused a water-level decline of as much as 240 ft between 1958 and 1976. A pumping depression has developed 5 mi southwest of Koehn Lake. Because the ground-water gradient is from Koehn Lake toward the pumping depression, the saline water under Koehn Lake poses a threat to the fresh-water supply.

As agriculture development continues on the northeast side of Koehn Lake, the water levels will decline at a greater rate, per unit of consumptive use, than they have southwest of the lake. Pumping depressions will probably develop, and saline water from under Koehn Lake may move in the direction of the depressions.

In order to more accurately assess the changing ground-water conditions, especially in the pumping depression and around Koehn Lake, the current monitoring program should be expanded to include about 25 wells for water-level monitoring and about 15 wells for water-quality monitoring. Two test wells, one northeast and one southwest of Koehn Lake, would help define the vertical and lateral extent of the saline water. Several aquifer tests would help in assessing the potential movement of the saline water.

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Moyle, W. R., Jr., 1969, Water wells and springs in the Fremont Valley area, Kern County, California: California Dept. Water Resources Bull. 91-16, 157 p.

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CURRENT AND HISTORIC GROUND WATER CONDITIONS IN THE FREMONT VALLEY KERN COUNTY, CALIFORNIA

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President

5 October 1993

RECHARGE

Figure 2: Catchment Area

The lithology of the Fremont Valley consists of consolidated ks of Tertiary and pre-Tertiary age and unconsolidated rmations of Quaternary age. Igneous and metamorphic rocks of re-Tertiary age, as well as Tertiary sedimentary and volcanic rocks form the basement, and are generally non-water-bearing except where interconnected fracture zones occur (Moyle, 1969, p.9).

Pleistocene alluvium underlies most of the valley and is the most important water-bearing formation. Unconsolidated Quaternary sediments consist of Older and Younger Alluvium and lacustrine deposits. Quaternary alluvium was found to extend to depths in excess of 1,740 ft below the surface (GSi/water, 1981, p.57). Quaternary alluvial fans offer a favorable environment for infiltration and deep percolation of precipitation and snow melt into the aquifers.

Ground water recharge in the Fremont Valley comes primarily from infiltration of precipitation falling within the catchment area. This consists of 564,252 acres and, for assessment purposes, has been divided into two sub-areas in this report. The Southern Sub-area includes 269,256 acres of low relief. The Northern Sub-area includes 294,996 acres of high relief in the Sierra Nevada and El Paso Mountains.

Average annual precipitation values for the National Oceanic and Atmospheric Administration's Mojave and Randsburg Stations were used to estimate precipitation for the Southern Sub-area. These values are 5.95 in. and 6.25 in., respectively. The estimate used is 6.10 in. (0.51 ft) for the period 1938 to 1992 (Appendix). It should be noted that precipitation accumulations for Calendar Years 1991 and 1992 were considerably above average (Appendix).

For the Northern Sub-area, the value of 11.5 in. (0.96 ft) used is estimated from an isohyetal (contours of equal precipitation) map (DWR, 1976, Bull. 195). Combining these figures, the average annual precipitation falling on the project area is 420,517 acre-feet (ac-ft). Only a small percentage of this precipitation actually recharges the ground water aquifer.

Infiltration over an area is difficult to measure because it varies widely by formation and condition. It is greatest along the fringes of the valley, where materials are coarse and permeable, and where much of the precipitation occurs as snow. Lowest infiltration rates will be found further into the basin, where ephemeral lakes and playas contain fine clay-like materials.

RECHARGE (Cont.)

Because it cannot be estimated precisely, we use a range from one to ten percent of average annual precipitation. The range of infiltration for the southern Sub-area is 1,400 to 14,000 ac-ft; for the northern Sub-area it is 2,800 to 28,000 ac-ft. The total average annual range is 4,200 to 42,000 ac-ft for the period 1938 to 1992.

In prior reports (GSi/water, 2/90, 6/90), changes in water level in selected hydrographs from wells shown on Figure 2 were used to estimate annual recharge. Annual agricultural and non-agricultural usage was used to arrive at estimates of natural recharge. Most of their estimates fall within this range except for those which represent extremely wet or extremely dry years.

Using actual data for the Southern Sub-area and proportional calculations for the Northern Sub-area, annual estimates were derived for 1991 and 1992, as shown below.

Long-Term Average for Southern Sub-area: 6.10 in. (0.51 ft)
Long-Term Value for Northern Sub-Area: 11.5 in. (0.96 ft)

1991 Average for Southern Sub-area: 7.46 in. (0.62 ft)
1991 Calculated Value for Northern Sub-area: 14.06 in. (1.17 ft)

1991 Estimated Recharge for Southern Sub-area:
269,256 acres x 0.62 ft x recharge range (1% to 10%) =
1,669 acre-ft to 16,694 acre-ft
1991 Estimated Recharge for Northern Sub-area:
294,996 acres x 1.17 ft x recharge range (1% to 10%) =
3,451 acre-ft to 34,514 acre-ft
1991 Total Estimated Recharge: 5,120 to 51,208 acre-ft

1992 Average for Southern Sub-area: 14.26 in. (1.19 ft)
1992 Calculated Value for Northern Sub-area: 26.88 in. (2.24 ft)

1992 Estimated Recharge for Southern Sub-area:
269,256 acres x 1.19 ft x recharge range (1% to 10%) =
3,204 acre-ft to 32,041 acre-ft
1992 Estimated Recharge for Northern Sub-area:
294,996 acres x 2.24 ft x recharge range (1% to 10%) =
6,608 acre-ft to 66,079 acre-ft
1992 Total Estimated Recharge: 9,812 to 98,093 acre-ft

OUTFLOW AND CONSUMPTIVE USE
Figure 3: Flow Toward Koehn Lake

Evaporation from Koehn Lake and transpiration from vegetation represent the major depletions of surface water. For most of the year, Fremont Valley is in a condition of net moisture deficit. Given the temperatures and other climatic conditions, potential evapotranspiration (the total amount of evapotranspiration assuming all water that could be evaportranspired is available), is several feet per year. Evaporation varies from about 6 ft to 9 ft per year in the southern portion of California (NOAA, 1991, p.38; 1992, p.38). For this reason, Koehn Lake and the stream courses which drain into it are dry except during and after precipitation events and the spring snow melt.

Evapotranspiration also depletes ground water. Ground water under confining pressures rises beneath the surface of Koehn Lake, where it becomes susceptible to evaporation. Plants such as alfalfa, creosote bush, tamarisk are phreatophytes, putting down a long tap root which reaches into the saturated formations.

Agricultural irrigation is a major consumptive use (GSi/water, 10/30/90). Under current agricultural practices, the amount applied and time of application is sufficient to keep plants from wilting. Thus, most agricultural water is evapotranspired. Historically, the major use of ground water has been agricultural. Usage reached its maximum in the middle 1970s when approximately 47,000 ac-ft/yr was pumped primarily for agriculture. In recent years, agricultural use has declined. Data for 1989, the most recent year available, indicate that irrigation is approximately 15,000 ac-ft/yr (GSi, 10/30/90, Appendix), a decrease of about 68%.

Minor uses are domestic, municipal and industrial. These may be consumptive if they remove water from further use. Usually, however, they return a portion of the water used, but water quality may be altered.

Calculations have been made to determine the potential amount of ground water that would flow into Koehn Lake in the absence of pumping. To account for variability within the basin, it has been divided into four quadrants as shown on Figure 3. Each quadrant has been assigned a hydraulic gradient equal to the slope of the ground water surface; and a transmissivity, the ease with which a 1-ft vertical column of aquifer transmits ground water. Darcy's Law states that:

$$Q = TiW$$

where Q = flow in gallons per day
T = transmissivity in gallons per day per ft (GSi, 1979, p.16)
i = hydraulic gradient in ft/ft (GSi, 1981, Figs. 10, 11, 12)
W = width of aquifer in ft

Using appropriate widths, the total amount of ground water moving toward Koehn Lake may be on the order of 18,000 ac-ft/yr. This is in accord with potential evaporation calculated for Koehn Lake. Well pumping, if sufficiently intensive, may cause temporary changes in the hydraulic gradients so that the ground water flows towards temporary depressions created by the pumping.

CONCLUSIONS

- Using average annual precipitation records, the long-term average annual ground water recharge is estimated to range from 4,200 to 42,000 acre-ft.

- The basin is closed. All surface water flows towards Koehn Lake. Ground water flows downgradient or rises under artesian pressure to discharge in Koehn Lake.

- Using derived estimates for transmissivity and hydraulic conductivity, an estimated average potential volume of 18,000 acre-ft of ground water may flow into Koehn Lake annually.

- In 1989, agricultural usage was estimated to be about 19,000 acre ft, having declined from a maximum of 47,000 acre ft in the early 1980s. Other uses, primarily domestic have risen.

- Water levels in many of the hydrographs show potentiometric increases; a few show declines. A major determinant appears to be the wells' positions with respect to the Sierra Nevada range front, with those closest showing the most rapid rises.

- Prior data indicate that at least in some parts of Fremont Valley, a multi-aquifer-aquitard system may extend to considerable depth below a confining or semi-confining layer. If so, there may be significantly greater amounts of ground water in storage than have been assumed.

APPENDIX C
PUMP TEST SUMMARY

MEMORANDUM

TO: Files

FROM: C.K. Dacre

DATE: August 18, 1997

SUBJECT: Fremont Ranch Pump Test Protocol and Results

The purpose of this memorandum is to document the test protocol, field observations, interpretation methods and conclusions concerning a pump test conducted at the Fremont Valley Ranch in Kern County, California on July 23 and 24, 1997. This test was conducted by Rottman Drilling Company of Lancaster, CA, with oversight by Jerry Rolwing of Samda and Cynthia Dacre of Earth Satellite Corporation. The analysis was performed by Earth Satellite Corporation.

The pump test was conducted on Well 63 in NE 1/4 NE 1/4, Section 8, T31S R37E. This well extends about 900 feet deeper than other wells in this area. Well 63 was previously tested at a rate of 4,000 gpm and a yield of 102.5 gpm/ft, and produced for a number of years until operations at the Fremont Ranch ceased. According to a report by GSi (1993)[1], there is evidence that this well is completed in a separate (confined) aquifer. The purpose of this test was to evaluate the aquifer properties in the vicinity of this well, to look for evidence of boundary conditions that may affect the well's performance, and to evaluate whether this well is in a separate aquifer or is in communication with the upper aquifer zones.

General Geologic Setting

The study area well is underlain by at least 1,700 feet of alluvial sediments between the Garlock and Cantil faults. The Cantil fault is visible as a 5 to 15-foot high ridge south and west of Well 63. The presence of this fault has been confirmed by boreholes that encountered granite at depths as shallow as 592 feet. The alluvial sediments are predominantly coarse sand and gravel, but clay layers have been logged in several nearby wells at depths of about 600 feet. However, it is not clear whether this clay represents a confining layer. Many of the well logs in this area describe a "hard" or cemented sand at about 800 feet that could also be a confining layer. In addition, Well 63 encountered another clay layer at about 1500 feet.

The direction of groundwater flow is anticipated to toward the northeast. Depth to water is currently about 400 feet. This is approximately 100 to 200 lower that water levels originally measured in this area in most wells. However, the water levels in Well 63 are actually about 60 feet *higher* than they were when the well was completed in 1981 (Table 1). This suggests that Well 63 may be completed in a different zone than the other wells. Other evidence that a confined aquifer exists at depth

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[1]GSi /water, 1993, Current and Historic Ground Water Conditions in the Fremont Valley Kern County, California. Prepared for Arciero Companies, October 5, 1993.

exists at depth includes a thermal log that showed a pattern consistent with a multi-aquifer system (GSi, 1993); artesian conditions in the center of the valley reported by Moyle (1969)[2]; and variations in salinity in wells of different depths as reported by Koehler (1977)[3].

TABLE 1

Well	Distance from Pumping Well (ft)	Standing Water Level (ft) and Date Water Level Measured	Comments
No. 63 - NE1/4 of NE1/4 T31S, R37E Sec. 8	0	404 in April 1981 348.5 on 7/23/97	-Perforated from 657 to 1730 ft -Clay layer @ 620 to 570 ft -Hard Sand @ 793 to 826 ft -Clay layer @ 1553 to 1612 ft -TD @ 1730
No. 49 - SE1/4 of NE1/4 T31S, R37E Sec. 8	890	260 in August 1974* 375 on 7/23/97 *Possible	Possible log for this well indicates - Perforated from 300 to 800 ft -Clay layer @ 640 to 670 ft -Hard Sand @ 700 to 800 ft -TD @ 800
No. 42 - NE1/4 of NW1/4 T31S, R37E Sec. 8	1/2 mi	399.75 on 7/23/97	
Domestic - NW1/4 of NW1/4 T31S, R37E Sec. 8	3/4 mi	190 in August 1973 420 in March 1997	-Perforated from 220 to 505 ft -TD @ 505

<u>**Well Configuration**</u> - Well 63 was drilled and completed in 1981. An 18-inch casing was installed to 657 feet (within the upper clay layer), and a 12 3/4-inch casing set below that to a depth of 1730 feet. The casing is perforated between 657 and 1730 feet. As a result, the well is not open to the

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[2]Moyle, W.R. Jr.,1969, Water wells and springs in the Fremont Valley Area, Kern County: California Department of Water Resources, Bulletin 91-16.

[3]Koehler, J. H., 1977, Ground water in the Koehn Lake Area, Kern County, California: U.S. Geological Survey Water Resources Investigation 77-66.

interval above the clay layer, but is perforated above and below the hard sand. The pump bowls were set at 500 feet.

Well 49 was used as an observation well during the pump test. Well 49 is located 890 feet south-southeast of Well 63. There is some confusion concerning the boring log for Well 49. Ranch records do not include a specific boring log for this well; however, there is apparently one extra log for the wells in Section 9. The extra log could be the well record for Well 49 if the well location changed after the well permit was obtained. If this assumption is correct, the upper clay layer in Well 49 is at a depth of 640 to 670 feet. and the base of the well at 800 feet is in the hard or cemented sand layer that starts at 700 feet. Based on this boring log, Well 49 is completed between 300 and 800 feet, above and below the clay layer, but not below the hard sand.

During the pump test, water levels were also monitored in Well 42, located about 1/2 mile west of Well 63. It was recognized that this well was likely too far away to see effects within the time that the pump test was conducted. However, the data from this well were used to confirm this assumption, and also serve as a control point to monitor any changes in water levels due to rainfall recharge or barometric pressure (it rained the day before the test). Water levels in Well 42 varied less than 1/20 of a foot, ranged from 399.71 to 399.75 over a 24-hour period, and actually increased slightly once pumping began.

Pump Rate and Duration - Prior to conducting the pump test, a constant pumping rate of 3,000 gpm was selected based on Rottman Drilling Company's experience with Well 63 and other wells in this area. A test duration of 24 hours was chosen because of indications that Well 63 is completed in a confined aquifer.

Measurement Protocol

Well yield was measured by means of an orifice weir. Water levels in the pumping well were measured by means of an airline. This method involves placing a small-diameter plastic tube from the top of a well to several feet below the lowest anticipated water level, pressurizing this air line, and recording the gauge pressure. The gauge pressure was multiplied by 2.31 (to convert from psi to feet) and subtracted from the depth to the bottom of the airline (in feet). For this pump test there was 483 feet of airline measured from about 3 feet above ground surface, so the airline extended to a depth 480 feet below ground surface. An attempt was made to also use an electronic water level indicator in Well 63 to improve the accuracy of measurement. However, oil from the pump fouled this instrument. Water levels in Observation Well 49 and Well 42 were measured by an electronic water level indicator.

The intervals for drawdown measurement were based on Driscoll (1986 page 553)[4] as shown in Table 2.

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[4]Driscoll, F. G., 1986. Groundwater and Wells. Published by Johnson Screens. St. Paul Minnesota.

TABLE 2

Time Since Pumping Started (or Stopped) in Minutes	Time Interval Between Measurements in Minutes
1 - 15	1
15 - 60	5
60 - 300	30
300 - 1440	60

After the pump test had been conducted for 720 minutes, the pump was stopped for 20 minutes to change a clogged filter, and this time was noted on the drawdown curves and pump test logs.

A water sample was collected from Well 63 and from the domestic well at the ranch (3/4 mile away) 23 hours after pumping began. The spigot at the ranch was opened for 20 minutes prior to sampling to obtain a sample representative of the upper aquifer. Both samples were analyzed for the parameters specified in California Title 22. Temperature, conductivity, and total dissolved solids were periodically measured during the test. The analytical results indicated that water from Well 63 meets water quality guidelines established by the California Department of Health Services. The analytical results for deep Well 63 and the shallower domestic well were very similar. However, the domestic well contained a higher concentration of nitrates (22 ppm), and exceeded the state guidance of 10 ppm for this analyte. The elevated nitrate concentrations in the shallow well is likely due to the use of fertilizer. Given that Well 63 contained 8 ppm. it appears that the elevated nitrate concentrations may be either limited vertically to the upper portion of the aquifer. or limited laterally to the area in the vicinity of the domestic well.

Table 3

Date and Time	Drawdown at Time of Collection	Temperature	Specific Conductivity	Total Dissolved Solids
7/23 12:20	29.5	30.8 °C	615	388
7/24 0:40	35.7	29.5 °C	645	407
7/24 11:30	35.7	29.6 °C	656	413

Evaluation of Results

The data from the pump test are presented in Tables 4 through 9, and Figures 1 through 5. These data were evaluated using several methods based on equations developed by Theis (1935)[5] and Cooper and Jacob (1946)[6], as discussed below.

Both methods involve using a relationship between pump rate and drawdown over time to calculate transmissivity (T) and storage coefficient (S) from pump test data. However, Theis's method involves using an exponential integral W(u), whereas Cooper and Jacob's method replaces W(u) with a logarithmic term that is easier to use. Cooper and Jacob's equation has little significant error as long as u is less than 0.05.

Our interpretation approach was to use the Cooper and Jacob's equation to calculate T from the drawdown data observed in the pumping well, and to check this value of T using the recharge data from the observation well. The Cooper and Jacobs method calls for plotting drawdown versus time on semi-logarithmic paper and using the slope to calculate T. The pumping well data had potential values for slope that resulted in possible T values ranging from 31,680 to 144,000 gpd/ft. This wide range in values is due to the limited resolution of the air-line measurement method (at best one-half of 2.3 feet per measurement which results in a resolution of 1.15 feet per measurement), and an apparent decrease in slope. Decreases in slope during pump tests are typically due to factors affecting the early part of the test such as casing storage effects, recharge, or noncompliance with other boundary conditions. Calculations indicated that casing storage effects would be insignificant after about 12 minutes; therefore, this factor was ruled out as a potential concern. The value of u was calculated and found to be less than 0.05 for the pumping well (Table 8), indicating that the Cooper and Jacob method should be applicable to the pumping well.[7]

A review of calculated u values for the potential range of S and T values showed that u exceeded 0.05 in the observation well for at least eight hours during the test, and therefore Cooper and Jacob's method is not applicable for data collected from this well during the first several hours of the test.[8]

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[5]Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage. *Transactions American Geophysical Union, Washington, D.C., pp 518 - 524.*

[6]Cooper, H.H. Jr. and Jacob, C.E., 1946. A generalized graphical method for evaluating formation constants and summarizing well field history. *Transactions American Geophysical Union, Washington, D.C., Vol. 27 No. 4.*

[7] Strict compliance with boundary conditions is rare for most aquifers, yet the Theis equation has still been found to be useful under most conditions.

[8]The main reason for the relatively large u value is the large distance between the observation well and the pumping well.

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A review of calculated u values for the potential range of S and T values showed that u exceeded 0.05 in the observation well for at least eight hours during the test, and therefore Cooper and Jacob's method is not applicable for data collected from this well during the first several hours of the test.[8]

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[5]Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage. *Transactions American Geophysical Union, Washington, D.C., pp 518 - 524.*

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[7] Strict compliance with boundary conditions is rare for most aquifers, yet the Theis equation has still been found to be useful under most conditions.

[8]The main reason for the relatively large u value is the large distance between the observation well and the pumping well.

Therefore, the drawdown data in the observation well were re-evaluated using the Theis equation and curve-matching technique. Based on Theis' approach, T equals 92,619 gpd/ft and S equals 2.42 x 10-3. These values appear reasonable, and are within the range indicated by the pumping well data.

Using these values for T and S, it was determined that it took slightly over 18 hours of pumping for u to equal less than 0.05 at the observation well. The drawdown after 20 hours was used to calculate the amount of drawdown that would be observed for different pumping rates (Figure 5).

Conclusions

The purpose of this test was to evaluate the aquifer properties in the vicinity of this well, to look for evidence of boundary conditions that may affect the well's performance, and to evaluate whether this well is in communication with the upper aquifer zones. The test results indicated that T equals 92,619 gpd/ft and S equals 2.42×10^{-3}. Specific yield for the pumping well stabilized at 85.3 gpm/ft after five hours.

The shape of the drawdown curve for the pumping well indicated that this well may benefit from a source of recharge. The type of recharge is not known. If this is a confined aquifer, it may be a leaky confining layer. Otherwise, it could be another subsurface water source, such as recharge from a fault system.

There was no evidence (such as an increased rate of drawdown in either well) of an impervious boundary or a limited extent to this aquifer. This means that it is possible, although not proven, that the lower aquifer could be productive at other locations. However, it should be noted that an impervious boundary would be expected to be seen within 24-hours only if the aquifer is confined. Because unconfined aquifers have a slower response time, pump tests to check for impervious boundaries for unconfined aquifers are typically run for 72 hours.

Well 49's definite response to pumping Well 63 is evidence that these two wells are in communication. Unfortunately, the degree of response between the upper and lower zones cannot be determined without verification of the configuration of Well 49. If Well 49 is completed above the upper clay unit (at around 600 feet), the well response will mean that Well 63 is in communication with the upper aquifer, and the aquifer at depth is probably not confined. If any deeper intervals are perforated, an understanding of whether the clay layer or hard sand is a confining layer would be necessary before evaluating the results. This is because Well 63 breached the hard sand, and Well 49 might have breached the clay layer (Figure 6).

In summary, Well 63 demonstrated that it is capable of sustaining a strong pumping rate. During the 24-hour test, there were no indications of a limited aquifer extent that would affect the drawdown. Good communication was seen to exist between this well and Well 49, about 900 feet away, but it cannot be determined whether this means that Well 63 is in communication with the upper aquifer until more is learned about the perforated interval of Well 49.

TABLE 4

FREMONT RANCH					
PUMPING WELL					
WELL 63					
DRAWDOWN					
NOTE: PUMPING WELL STOPPED FOR 2 0 MINUTES AT 2300; ALSO TIME IS OFFSET					
FROM OBSERVATION WELL BY 10 MINUTES					
TIME	TIME SINCE PUMP STARTED	READING	CONVERTED READING	SPECIFIC YIELD	DRAWDOWN
1210	0	58	348.5		
1211	1				
1212	2	54	358	307.4	9.8
1213	3	52	363	208.9	14.5
1214	4				
1215	5				
1216	6	50	367.5	157.9	19
1217	7				
1218	8	48	372	127.01	23.62
1219	9				
1220	0	47.5	373	121.11	24.77
1221	11	47	374	115.69	25.93
1222	12	46.5	375	110.78	27.03
1223	13	46	377	105.26	28.5
1224	14	46	377	105.26	28.5
1225	15	45.5	378	101.69	29.5
1230	20	45.5	378	101.69	29.5
1235	25	45.5	378	101.69	29.5
1240	30	45.5	378	101.69	29.5
1245	35	45.5	378	101.69	29.5
1250	40	45.5	378	101.69	29.5
1255	45	45.5	378	101.69	29.5
1260	50	45	379	98.2	30.6
1305	55	45	379	98.2	30.6
1310	60	44.5	380	94.6	31.7
1340	90	44	381	91.3	32.8
1410	120	44	381	91.3	32.8
1440	150	44	381	91.3	32.8
1510	180	44	381	91.3	32.8
1540	210	43	384	85.3	35.7
1610	240	43	384	85.3	35.7
1640	270	43	384	85.3	35.7
1710	300	43	384	85.3	35.7
1740	330	43	384	85.3	35.7
1810	360	43	384	85.3	35.7
1910	420	43	384	85.3	35.7
2010	460	43	384	85.3	35.7
2110	540	43	384	85.3	35.7
2210	600	43	384	85.3	35.7
2310	660	43	384	85.3	35.7
2330	690	43	384	85.3	35.7
30	750	43	384	85.3	35.7
130	810	43	384	85.3	35.7
230	870	43	384	85.3	35.7
330	930	43	384	85.3	35.7
430	990	43	384	85.3	35.7
530	1050	43	384	85.3	35.7
630	1110	43	384	85.3	35.7
730	1170	43	384	85.3	35.7
830	1230	43	384	85.3	35.7
930	1290	43	384	85.3	35.7
1030	1350	43	384	85.3	35.7
1130	1410	43	384	85.3	35.7
1200	1440	43	384	85.3	35.7

TABLE 5

FREMONT RANCH					
OBSERVATION WELL					
WELL 49					
DRAWDOWN					
NOTE: PUMPING WELL STOPPED FOR 2 0 MINUTES AT 2300: ALSO TIME IS OFFSET					
FROM PUMPING WELL TIME BY 10 MINUTES					
TIME	TIME SINCE		CONVERTED		
	PUMP STARTED	READING	READING	DRAWDOWN	
1200		378	375	0	
1300	60	378.9	375.9	0.9	
1330	90	379.5	376.5	1.5	
1400	120	380	377.2	2.2	
1450	150	381.3	378.3	3.3	
1550	180	382.2	379.2	4.2	
1610	250	382.5	379.5	4.5	
1630	270	383	380	5	
1700	300	383.25	380.25	5.25	
1800	360	383.5	380.5	5.5	
1900	420	383.8	380.8	5.8	
2000	480	384	381	6	
2100	540	384.25	381.25	6.25	
2200	600	384.25	381.25	6.25	
2300	660	384.58	381.58	6.58	
2330	690	382.17	379.17	4.17	
15	735	383.17	380.17	5.17	
30	750	384.08	381.08	6.08	
130	810	384.67	381.67	6.67	
230	870	385	382	7	
330	930	385.35	382.35	7.35	
430	990	385.41	382.41	7.41	
530	1050	384.75	381.75	6.75	
630	1110	385	382	7	
730	1170	385.4	382.4	7.4	
830	1230	385.6	382.6	7.6	
930	1290	385.5	382.5	7.5	
1030	1350	385.25	382.25	7.25	
1100	1380	385.3	382.3	7.3	
1130	1410	385.3	382.3	7.3	
1210	1450	385.4	382.4	7.4	

TABLE 6

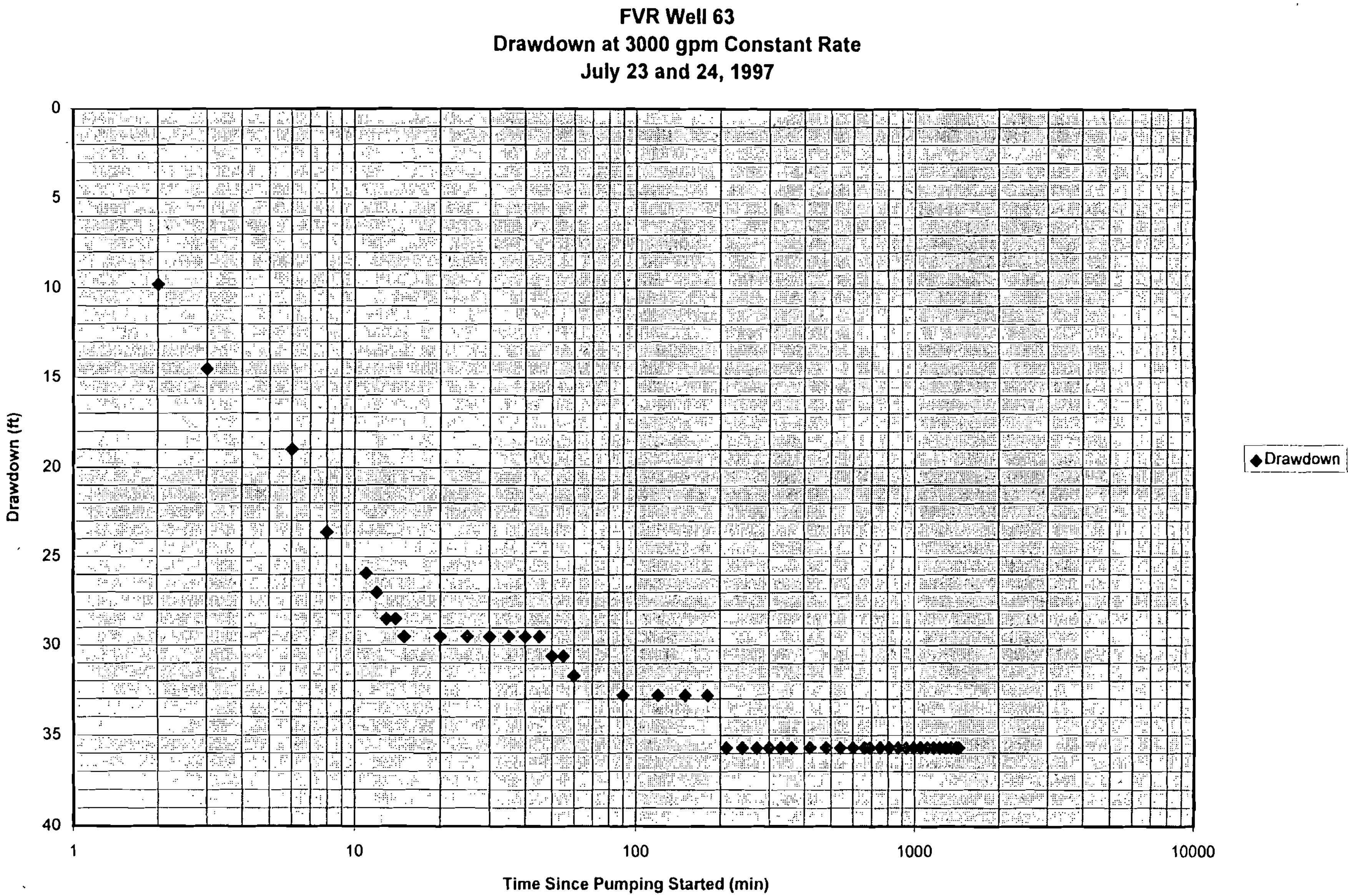
FREMONT RANCH				
PUMPING WELL				
WELL 63				
RECOVERY				
TIME	TIME SINCE PUMP STOPPED	READING	CONVERTED READING	RESIDUAL DRAWDOWN
1210	0			
1211	1	48	372	23.5
1212	2	49	369.8	21.3
1213	3	49.5	368.6	20.1
1214	4	50	367.5	19
1215	5	50	367.5	19
1216	6	50	367.5	19
1217	7	50.5	366.3	17.8
1218	8	50.5	366.3	17.8
1219	9	51	365.2	16.7
1220	0	51	365.2	16.7
1221	11	51	365.2	16.7
1222	12	51	365.2	16.7
1223	13	51	365.2	16.7
1224	14	52	362.8	14.3
1225	15	52.5	361.7	13.2
1230	20	52.5	361.7	13.2
1235	25	52.5	361.7	13.2
1240	30	52.5	361.7	13.2
1245	35	52.5	361.7	13.2
1250	40	52.5	361.7	13.2
1255	45	52.5	361.7	13.2
1260	50	52.5	361.7	13.2
1305	55	52.5	361.7	13.2
1310	60	53	360.5	12
1340	90	53	360.5	12
1410	120	54.5	357.1	8.6

TABLE 7

FREMONT RANCH				
OBSERVATION WELL				
WELL 49				
RECOVERY				
TIME	TIME SINCE PUMP STOPPED	READING	CONVERTED READING	RESIDUAL DRAWDOWN
1210	0	385.3	382.3	7.3
1211	1	385.3	382.3	7.3
1212	2	385.3	382.3	7.3
1213	3	385.25	382.25	7.25
1214	4	385.25	382.25	7.25
1215	5	385.25	382.25	7.25
1216	6	385.25	382.25	7.25
1217	7	385	382	7
1218	8	385	382	7
1219	9	385	382	7
1220	0	385	382	7
1221	11	385	382	7
1222	12	385	382	7
1223	13	385	382	7
1224	14	384.75	381.75	6.75
1225	15	384.6	381.6	6.6
1230	20	384.2	381.2	6.2
1235	25	383.9	380.9	5.9
1240	30	383.7	380.7	5.7
1245	35	383.5	380.5	5.5
1250	40	383.2	380.2	5.2
1255	45	383.1	380.1	5.1
1260	50	382.9	379.9	4.9
1305	55	382.75	379.75	4.75
1310	60	382.6	379.6	4.6
1420	130	381.5	378.5	3.5
1530	200	381.3	378.3	3.3
1600	230	381.1	378.1	3.1
1630	260	380.8	377.8	2.8

		Value of u at t = 1 day				
			(vary T, to, and S)			
Observation Well						
r	T	to	S	t	u	
890	31680	0.03125	0.000375	1	0.017531	
890	31680	0.040278	0.0004833	1	0.022596	
890	92169	–	0.00242	1	0.038891	
890	92169	–	0.00242	1	0.038891	
890	144000	0.03125	0.0017043	1	0.017531	
890	144000	0.040278	0.0021967	1	0.022596	
Pumping Well						
0.75	31680	0.03125	0.000375	1	1.24E-08	
0.75	31680	0.040278	0.0004833	1	1.6E-08	
0.75	92169	–	0.00242	1	2.76E-08	
0.75	92169	–	0.00242	1	2.76E-08	
0.75	144000	0.03125	0.0017043	1	1.24E-08	
0.75	144000	0.040278	0.0021967	1	1.6E-08	
		Time Needed for u to Approach 0.05				
			(vary T, to, and S)			
Observation Well						
r	T	to	S	t	u	
890	31680	0.03125	0.000375	0.35	0.050089	
890	31680	0.040278	0.0004833	0.45	0.050213	
890	92,169	–	0.00242	0.75	0.051855	
890	92169	–	0.00242	0.75	0.051855	
890	144000	0.03125	0.0017043	0.35	0.050089	
890	144000	0.040278	0.0021967	0.45	0.050213	
Pumping Well						
0.75	31680	0.03125	0.000375	0.000694	1.79E-05	
0.75	31680	0.040278	0.0004833	0.000694	2.31E-05	
0.75	92,169	–	0.00242	0.000694	3.98E-05	
0.75	92169	–	0.00242	0.000694	3.98E-05	
0.75	144000	0.03125	0.0017043	0.000694	1.79E-05	
0.75	144000	0.040278	0.0021967	0.000694	2.31E-05	
	0.35 =	504	min			
	0.45 =	648	min			
	.75 =	1080	min			
	0.000694	1	min			

Figure 1



FVR Well 63
Drawdown at 3000 gpm Constant Rate
July 23 and 24, 1997
Drawdown (ft)
0
5
10
15
20
25
30
35
40
1
10
100
1000
10000
Time Since Pumping Started (min)
Drawdown

Figure 2

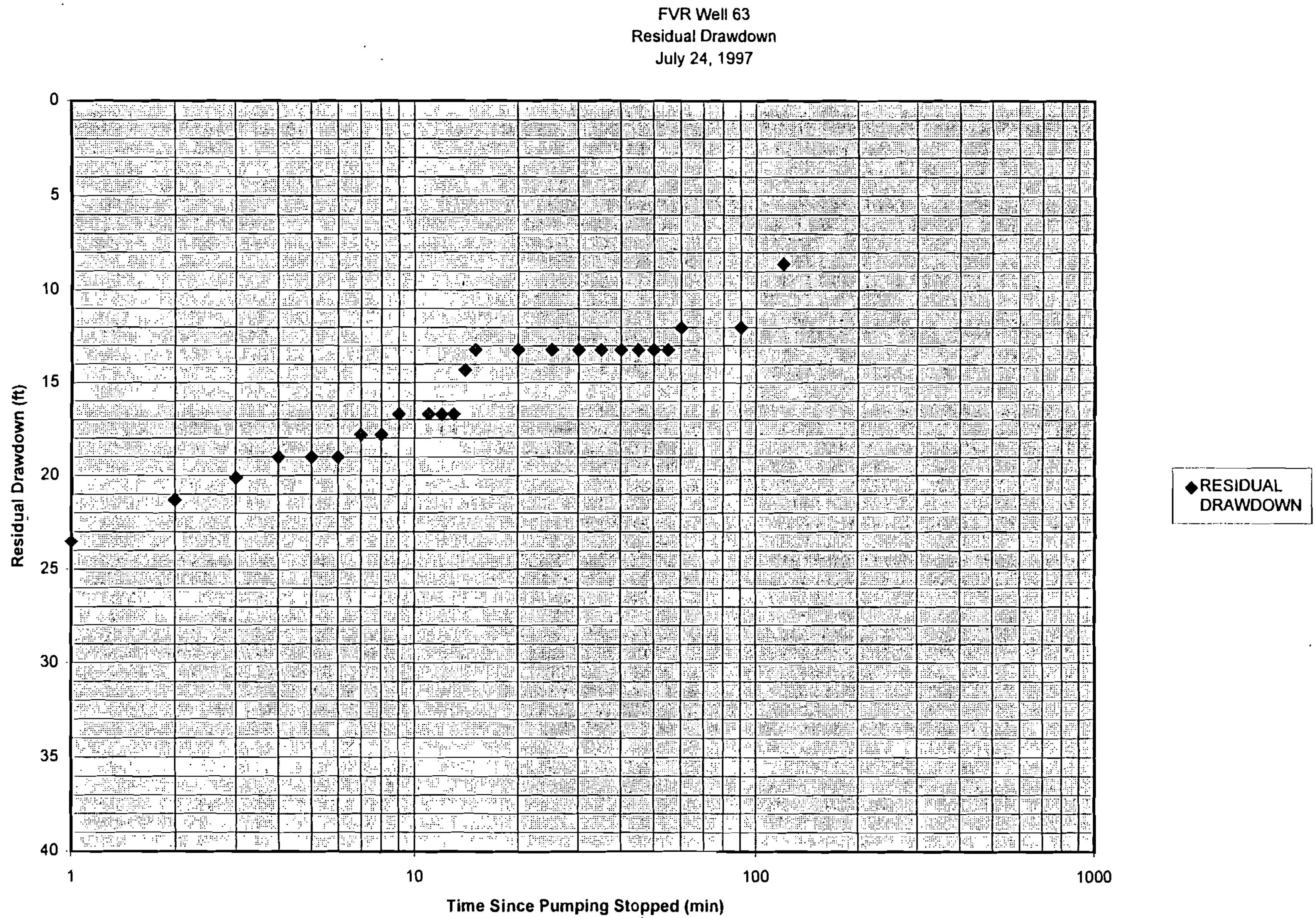

FVR Well 63
Residual Drawdown
July 24, 1997
Residual Drawdown (ft)
Time Since Pumping Stopped (min)
RESIDUAL DRAWDOWN
0
5
10
15
20
25
30
35
40
1
10
100
1000

Figure 3

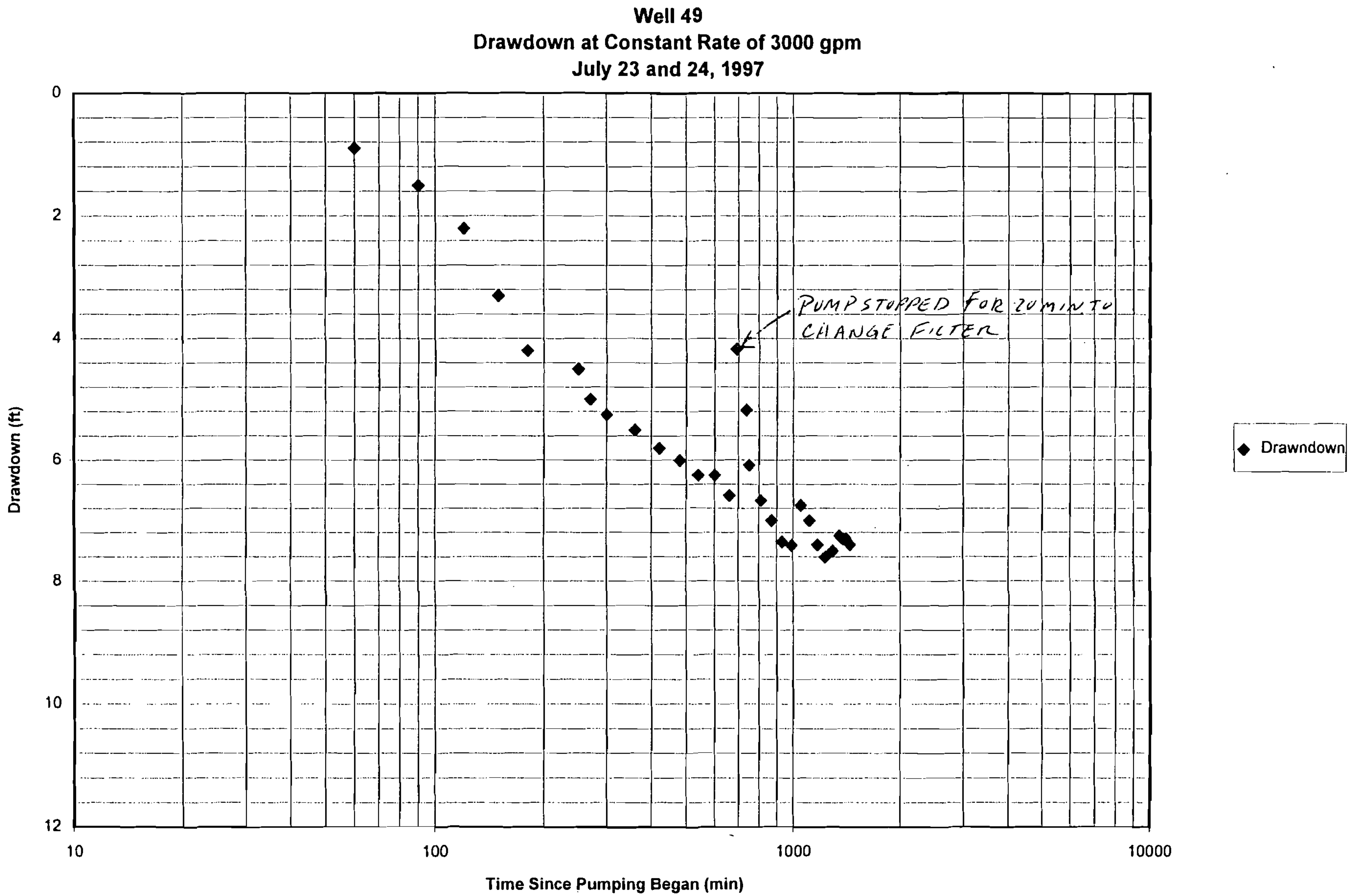
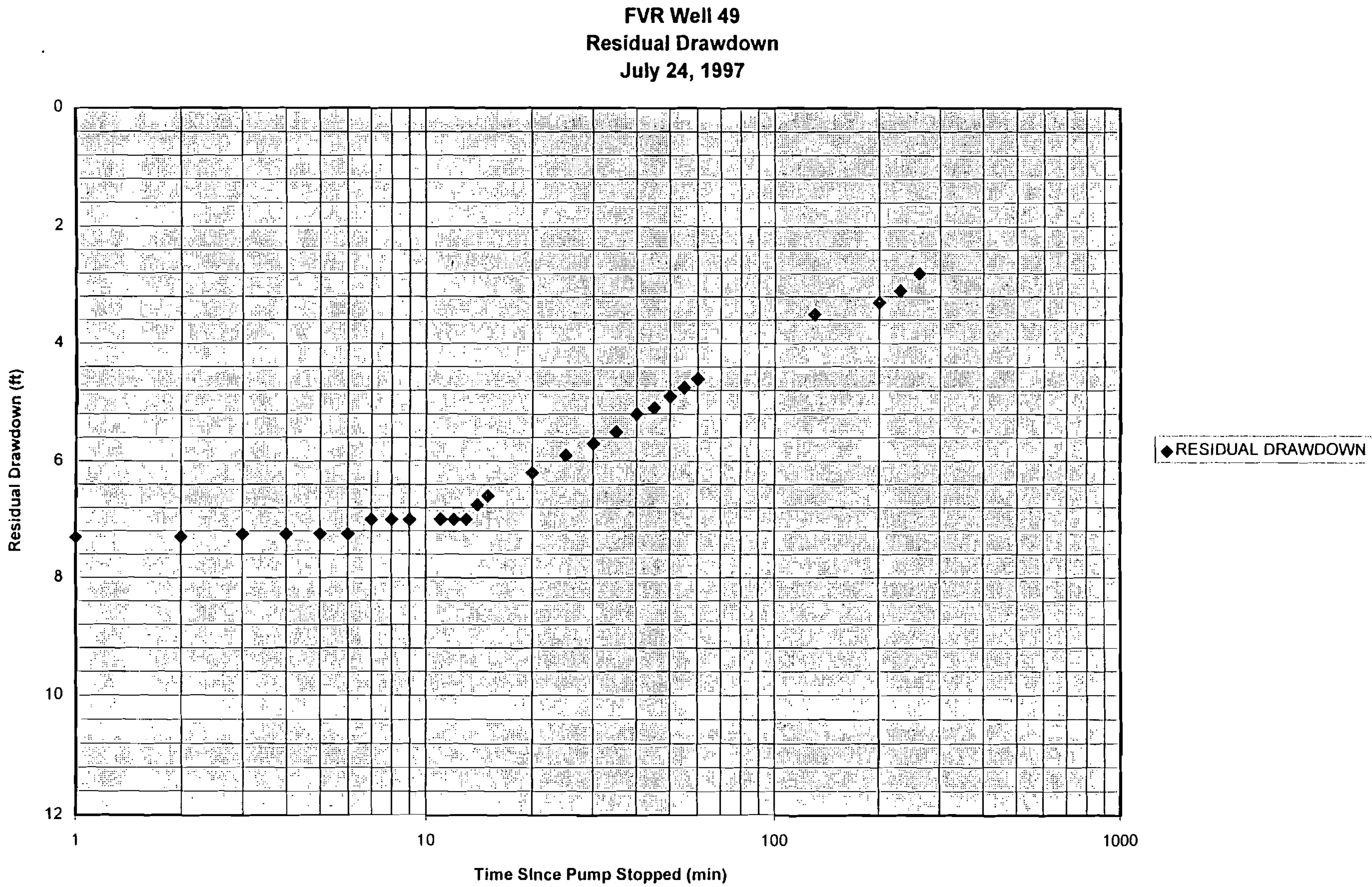

Well 49
Drawdown at Constant Rate of 3000 gpm
July 23 and 24, 1997
Drawdown (ft)
0
2
4
6
8
10
12
10
100
1000
10000
Time Since Pumping Began (min)
Drawdown
PUMP STOPPED FOR 20 MIN TO
CHANGE FILTER

Figure 4


FVR Well 49
Residual Drawdown
July 24, 1997
Residual Drawdown (ft)
0
2
4
6
8
10
12
1
10
100
1000
Time Since Pump Stopped (min)
RESIDUAL DRAWDOWN

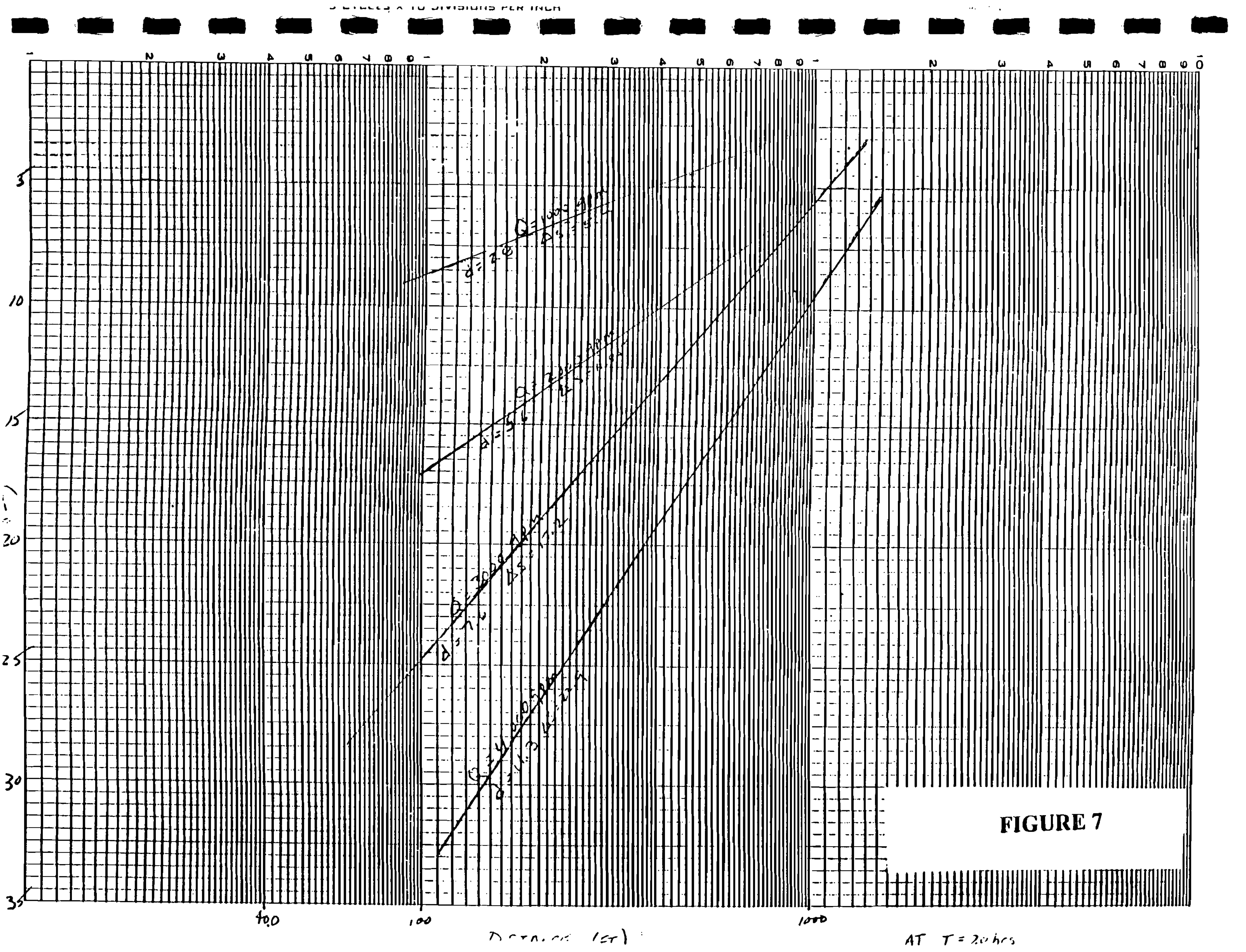

3 CYCLES X 10 DIVISIONS PER INCH
Q = 1000 GPM
d = 2.0
Q = 2000 GPM
d = 5.6
Q = 3000 GPM
d = 7.2
Q = 4000 GPM
AT T = 20 hrs

FIGURE 7

Figure 5

Well 49
Drawdown at Constant Rate of 3000 gpm
July 23 and 24, 1997

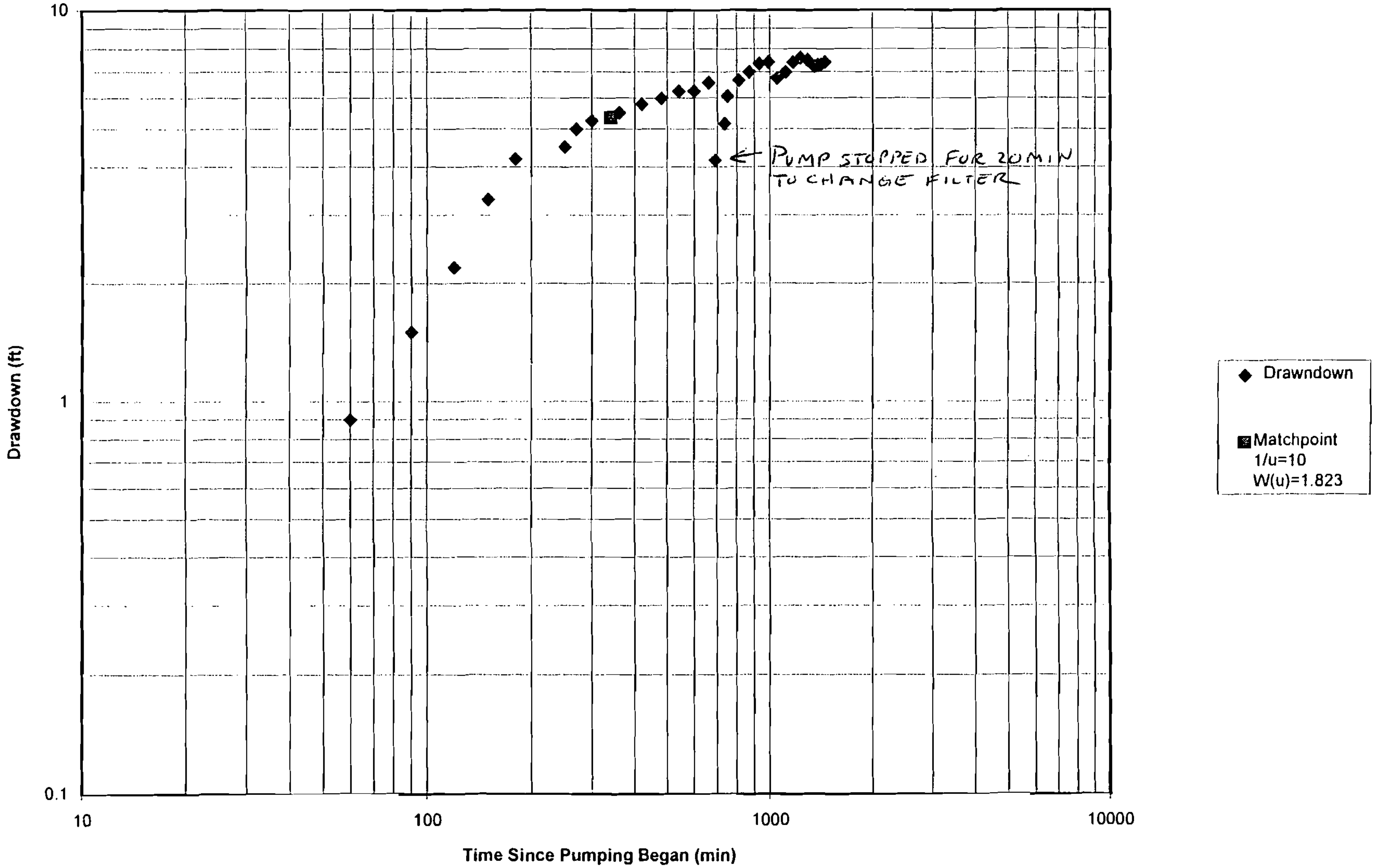
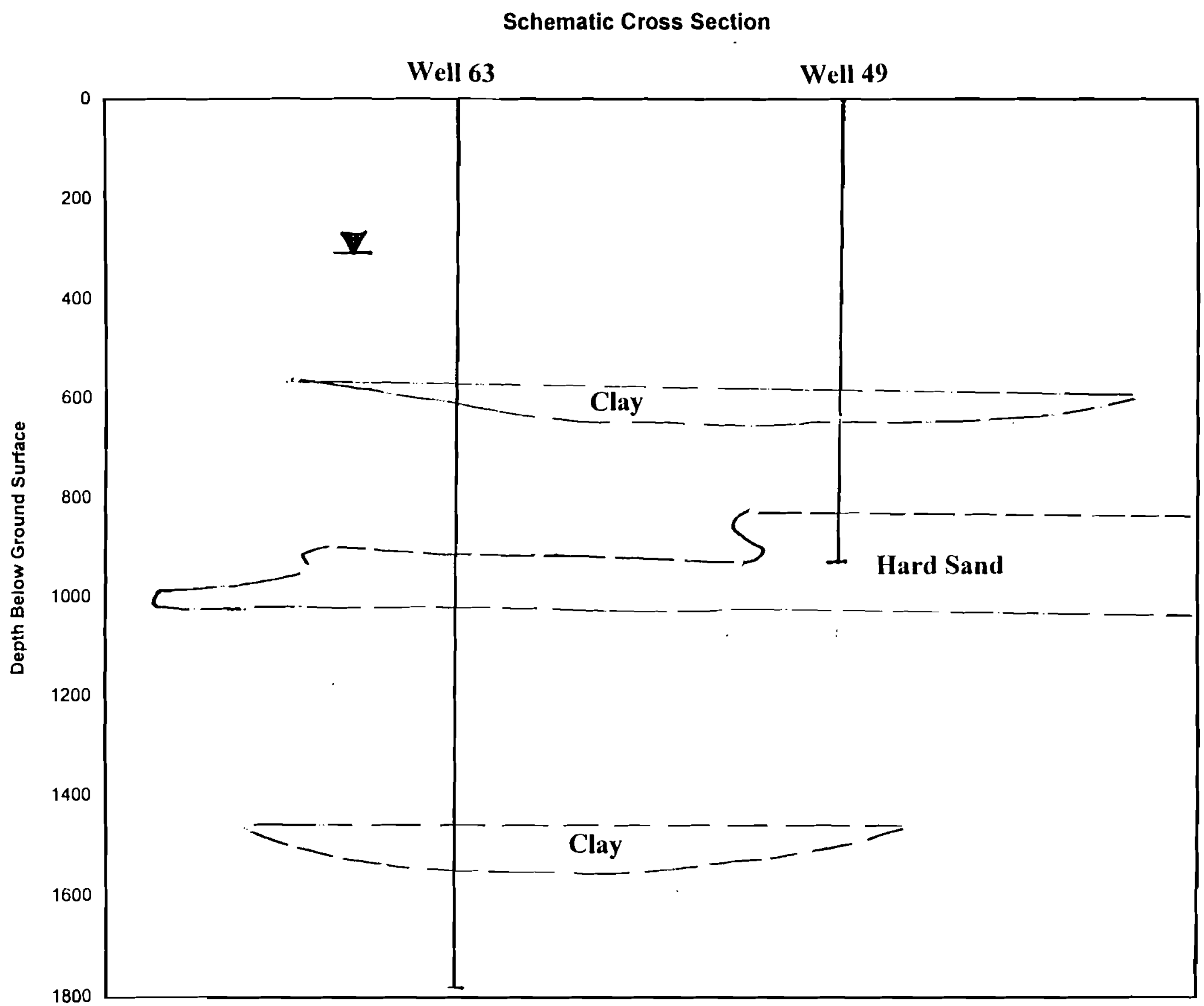


FIGURE 6



Schematic Cross Section
Well 63
Well 49
0
200
400
600
800
1000
1200
1400
1600
1800
Depth Below Ground Surface
Clay
Hard Sand
Clay

APPENDIX D
GRAPHS OF PRECIPITATION RATES, ESTIMATED RECHARGE & USGS WELL DATA

LOCAL ID 029S037E34B001M
SITE ID 352226117592201
LATITUDE 352226
LONGITUDE 1175922
ALTITUDE OF LAND-SURFACE DATUM 2590.00
NEAR RICARDO CAFE AND GAS STATION. DUG UNUSED WATER-TABLE WELL. DIAM 8 IN, DEPTH 100 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
FEB 27, 1958	8.70	JUL 20, 1962	9.75

HIGHEST 8.70 FEB 27, 1958
LOWEST 9.75 JUL 20, 1962

LOCAL ID 030S037E12N001M
SITE ID 351955117575801
LATITUDE 351955
LONGITUDE 1175758
ALTITUDE OF LAND-SURFACE DATUM 2185.00
ABOUT 1.5 MI NORTH OF CANTIL. DRILLED DOMESTIC WATER-TABLE WELL. DIAM 6 IN, DEPTH 160 FT, PERFORATED 60-160 FT. ALTITUDE OF LSD 2185 FT. RECORDS AVAILABLE 1953, 1956, 1958.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
APR 23, 1953	104.80	AUG 27, 1956	107.15	FEB 27, 1958	106.57

HIGHEST 104.80 APR 23, 1953
LOWEST 107.15 AUG 27, 1956

LOCAL ID 030S037E13C001M
SITE ID 351948117573901
LATITUDE 351948
LONGITUDE 1175739
ALTITUDE OF LAND-SURFACE DATUM 2150.00
About 1.5 miles north of Cantil. Drilled unused water-table well in alluvium. Diameter 16 inches, original depth 336 feet, depth measured 333 feet in 1976, 326.4 feet in 1993, perforated 90-336 feet. Altitude of land-surface datum 2,150 feet. Water-level records available 1974, 1976, 1978 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
NOV 15, 1974	140.00 R	JUN 07, 1978	140.25 S	DEC 20, 1978	135.10 S	MAY 29, 1979	132.75
JAN 14, 1976	144.84	JUL 06	139.67 S	JAN 18, 1979	134.19 S	JUN 13	132.63
MAR 09, 1978	140.81	AUG 02	139.07 S	FEB 09	133.85	26	132.59
21	140.74	30	138.30 S	12	133.72	JUL 26	132.00
28	140.80	SEP 27	137.60 S	MAR 08	133.46	AUG 21	131.58
APR 10	140.75 S	OCT 25	136.80 S	APR 05	133.34	SEP 18	130.99
MAY 10	140.55 S	NOV 22	135.87 S	MAY 04	133.03	OCT 17	130.40

LOCAL ID 030S037E13C001M CONTINUED--

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
NOV 13, 1979	129.85		MAY 27, 1981	126.85		DEC 20, 1982	127.95		JUL 27, 1984	132.19	S
DEC 11	129.32		JUN 23	127.08		JAN 18, 1983	128.27	S	AUG 29	132.36	S
JAN 08, 1980	128.70		JUL 21	127.45		FEB 16	128.57	S	SEP 29	132.52	S
FEB 05	128.41		AUG 19	127.80		MAR 16	128.80	S	NOV 01	132.69	S
MAR 04	128.19		SEP 16	127.88		APR 12	129.06	S	28	132.79	S
APR 01	128.06	S	OCT 16	127.96		MAY 10	129.33	S	DEC 20	132.98	S
30	128.12		NOV 09	127.94		JUN 09	129.68	S	JAN 14, 1985	133.01	S
JUN 01	128.16		DEC 10	128.01		JUL 07	129.89	S	MAR 27, 1986	134.65	S
21	128.10	S	JAN 05, 1982	127.94	S	AUG 09	130.22	S	FEB 23, 1987	135.37	S
JUL 22	127.74		FEB 03	128.08	S	SEP 06	130.38	S	MAR 29, 1988	136.68	S
AUG 19	127.38		MAR 03	128.31		OCT 06	130.65	S	MAR 22, 1989	137.53	S
SEP 17	126.79		12	128.26		NOV 08	130.92		MAR 12, 1990	138.17	S
OCT 15	126.35		APR 02	128.62		16	130.79		APR 18, 1991	139.33	S
NOV 17	125.94		26	128.68		DEC 07	131.19		APR 16, 1992	139.96	S
DEC 19	125.66		MAY 24	128.70		JAN 11, 1984	131.31		APR 20, 1993	140.05	S
JAN 14, 1981	125.48		JUN 24	128.45		FEB 07	131.54		APR 12, 1994	138.68	S
FEB 03	125.45		JUL 22	127.79		MAR 09	131.57		APR 19, 1995	139.66	S
11	125.64		AUG 23	127.20		APR 05	131.60	S	APR 18, 1996	140.33	S
MAR 09	125.88		SEP 21	127.24		MAY 03	131.80	S	MAR 05, 1997	140.42	S
APR 06	125.99		OCT 18	127.32		30	131.79	S			
28	126.45		NOV 15	127.51		JUN 28	131.82	S			

HIGHEST 125.45 FEB 03, 1981
LOWEST 144.84 JAN 14, 1976

LOCAL ID 030S037E14N001M
SITE ID 351859117585001
LATITUDE 351859
LONGITUDE 1175850
ALTITUDE OF LAND-SURFACE DATUM 2145.00
NEAR RANDSBURG AND REDROCK ROAD. UNUSED WATER-TABLE WELL. DIAM 6 IN, DEPTH 200 FT. ALTITUDE OF LSD 2145 FT. RECORDS AVAILABLE 1956, 1976.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
AUG 29, 1956	89.80	S	JAN 13, 1976		D

HIGHEST 89.80 AUG 29, 1956
LOWEST 89.80 AUG 29, 1956

LOCAL ID 030S037E23D001M
SITE ID 351848117590801
LATITUDE 351848
LONGITUDE 1175908
ALTITUDE OF LAND-SURFACE DATUM 2120.00
NEAR CANTIL. DOMESTIC WATER-TABLE WELL. DIAM 6 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
JUL 27, 1956	182.85	FEB 26, 1958	184.69

HIGHEST 182.85 JUL 27, 1956
LOWEST 184.69 FEB 26, 1958

LOCAL ID 030S037E23J001M
SITE ID 351826117580601
LATITUDE 351826
LONGITUDE 1175806
ALTITUDE OF LAND-SURFACE DATUM 2010.00
NEAR CANTIL. DRILLED PUBLIC SUPPLY WATER-TABLE WELL. DIAM 10 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
MAR 18, 1953	55.74	JAN 14, 1976	187.56

HIGHEST 55.74 MAR 18, 1953
LOWEST 187.56 JAN 14, 1976

LOCAL ID 030S037E23J003M
SITE ID 351827117580901
LATITUDE 351827
LONGITUDE 1175809
ALTITUDE OF LAND-SURFACE DATUM 2010.00
ABOUT 0.25 MI SOUTHEAST OF CANTIL. DEPTH 431 FT IN 1919, ALTITUDE ABOUT 2010 FT. RECORDS AVAILABLE 1919, 1948

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
, 1919	60.40	SEP 02, 1948	56.80 R

HIGHEST 56.80 SEP 02, 1948
LOWEST 60.40 , 1919

LOCAL ID 030S037E23J005M
SITE ID 351825117580601
LATITUDE 351825
LONGITUDE 1175806
ALTITUDE OF LAND-SURFACE DATUM 2005.00
NORTH OF MUNSEY AND NORTON INTERSECTION. DRILLED DOMESTIC WATER-TABLE WELL IN SAND AND GRAVEL OF QUATERNARY AGE. DIAM 12 IN, DEPTH 505 FT, CASED TO 500 FT, PERFORATED 302-500 FT. ALTITUDE OF LSD 2005 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 14, 1976	177.57 T

LOCAL ID 030S037E24G001M
SITE ID 351844117572201
LATITUDE 351844
LONGITUDE 1175722
ALTITUDE OF LAND-SURFACE DATUM 2000.00
ABOUT 0.85 MI NORTHEAST OF CANTIL. DRILLED UNUSED WATER-TABLE WELL. DIAM 12 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
MAY 05, 1953	48.01	AUG 29, 1956	49.33	FEB 26, 1958	50.73	JAN 15, 1976	125.57

HIGHEST 48.01 MAY 05, 1953
LOWEST 125.57 JAN 15, 1976

LOCAL ID 030S037E24G002M
SITE ID 351833117572901
LATITUDE 351833
LONGITUDE 1175729
ALTITUDE OF LAND-SURFACE DATUM 1990.00
NORTH OF MUNSEY AND NORTON INTERSECTION. DRILLED UNUSED WATER-TABLE WELL. DIAM 8 IN, DEPTH 200 FT. ALTITUDE OF LSD 1990 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 15, 1976	133.60 T

LOCAL ID 030S037E24G003M
SITE ID 351834117573001
LATITUDE 351834
LONGITUDE 1175730
ALTITUDE OF LAND-SURFACE DATUM 1975.00
NEAR CORNER OF CANTIL AND VALLEY. DIAM UNKNOWN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 15, 1976	118.96	T

LOCAL ID 030S037E24J001M
SITE ID 351832117570801
LATITUDE 351833
LONGITUDE 1175708
ALTITUDE OF LAND-SURFACE DATUM 1975.00
ABOUT 1 MI EAST OF CANTIL. DRILLED UNUSED WELL IN ALLUVIUM. DIAM 12 IN, DEPTH 107.9 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
AUG 29, 1956	25.50		OCT 18, 1965	49.60		OCT 31, 1968	57.53		OCT 28, 1971	84.37	S
FEB 26, 1958	25.75		MAR 09, 1966	47.22		APR 15, 1969	56.58		MAR 15, 1972	81.76	S
NOV 07, 1963	43.63		OCT 17	52.47		SEP 18	64.54		FEB 15, 1973	88.30	
MAR 04, 1964	41.76		APR 12, 1967	51.46		MAR 17, 1970	59.92		FEB 14, 1974		D
OCT 07	47.44		OCT 11	54.95		OCT 22	74.09	S	JAN 14, 1976		D
MAR 16, 1965	45.88		MAR 20, 1968	53.16		MAR 17, 1971	70.88	S			

HIGHEST 25.50 AUG 29, 1956
LOWEST 88.30 FEB 15, 1973

LOCAL ID 030S037E24J002M
SITE ID 351825117570101
LATITUDE 351825
LONGITUDE 1175701
ALTITUDE OF LAND-SURFACE DATUM 1960.00
ABOUT 200 FT WEST OF PAPPAS ROAD AND 0.15 MI SOUTH OF VALLEY ROAD. UNUSED WATER-TABLE WELL. DIAM 8 IN, DEPTH 206.2 FT. ALTITUDE OF LSD 1960 FT. RECORDS AVAILABLE 1974-77, 1979.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
FEB 14, 1974	92.20	S	JAN 14, 1976	110.45		FEB 12, 1979	109.73				
FEB 06, 1975	99.30		MAR 08, 1977	118.07		MAR 05, 1982		N			

HIGHEST 92.20 FEB 14, 1974
LOWEST 118.07 MAR 08, 1977

LOCAL ID 030S037E24J003M
SITE ID 351824117570101
LATITUDE 351824
LONGITUDE 1175701
ALTITUDE OF LAND-SURFACE DATUM 1960.00
Near Cantil. Drilled domestic water-table well. Diameter 6 inches, depth 250 feet. Altitude of land-surface datum 1,960 feet. Water-level records available 1980-83.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
APR 23, 1980	139.34	FEB 17, 1982	139.47	APR 27, 1983	144.87 S		
APR 16, 1981	140.47	19	139.47 S				

HIGHEST 139.34 APR 23, 1980
LOWEST 144.87 APR 27, 1983

LOCAL ID 030S037E24K001M
SITE ID 351832117571401
LATITUDE 351832
LONGITUDE 1175714
ALTITUDE OF LAND-SURFACE DATUM 1970.00
EAST OF CANTIL. DRILLED UNUSED WATER-TABLE WELL. DIAM 8 IN, DEPTH 211 FT, PERFORATED 73-211 FT. ALTITUDE OF LSD 1970 FT. RECORDS AVAILABLE 1956, 1958, 1976.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
AUG 29, 1956	22.23	FEB 26, 1958	23.66	JAN 14, 1976	126.40

HIGHEST 22.23 AUG 29, 1956
LOWEST 126.40 JAN 14, 1976

LOCAL ID 030S037E24K002M
SITE ID 351831117572801
LATITUDE 351831
LONGITUDE 1175728
ALTITUDE OF LAND-SURFACE DATUM 1980.00
ABOUT 0.75 MI EAST OF CANTIL. DRILLED DOMESTIC WATER-TABLE WELL. DIAM 6 IN, DEPTH 120 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
AUG 29, 1956	27.55	FEB 26, 1958	28.23	JAN 15, 1976	92.65

HIGHEST 27.55 AUG 29, 1956
LOWEST 92.65 JAN 15, 1976

LOCAL ID 030S037E24M001M
SITE ID 351819117580001
LATITUDE 351819
LONGITUDE 1175800
ALTITUDE OF LAND-SURFACE DATUM 1987.00
ABOUT 0.4 MI SOUTHEAST OF CANTIL. DRILLED UNUSED WATER-TABLE WELL. DIAM 8 IN, DEPTH 55 FT IN 1962.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
OCT 03, 1929	37.50 R	NOV 15, 1955	41.36	FEB 26, 1958	43.77	NOV 10, 1960	51.81
MAR 18, 1953	32.64	MAR 19, 1956	40.90	NOV 05	45.68	FEB 27, 1961	51.94
FEB 17, 1954	39.21	NOV 27	42.22	MAR 10, 1959	46.01	NOV 14	54.20
NOV 30	41.15	MAR 06, 1957	41.95	DEC 02	48.82	MAR 14, 1962	54.56
MAR 02, 1955	40.85	NOV 22	43.84	FEB 26, 1960	49.17	NOV 09	D

HIGHEST 32.64 MAR 18, 1953
LOWEST 54.56 MAR 14, 1962

LOCAL ID 030S037E24M002M
SITE ID 351817117575901
LATITUDE 351817
LONGITUDE 1175759
ALTITUDE OF LAND-SURFACE DATUM 1985.00
Near intersection of Norton and Munsey Streets. Drilled irrigation water-table well in alluvium of quaternary age. Diameter 14 inches, depth 615 feet, perforated 300-615 feet. Altitude of land-surface datum 1,985 feet. Water-level records available 1976.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 14, 1976	159.84 S

LOCAL ID 030S037E24R001M
SITE ID 351814117571001
LATITUDE 351814
LONGITUDE 1175710
ALTITUDE OF LAND-SURFACE DATUM 1955.00
ABOUT 1.1 MI SOUTHEAST OF CANTIL. DRILLED UNUSED WATER-TABLE WELL. DIAM 8 IN, DEPTH 197 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
AUG 30, 1956	3.75	FEB 26, 1958	3.97

HIGHEST 3.75 AUG 30, 1956
LOWEST 3.97 FEB 26, 1958

LOCAL ID 030S037E24R002M
SITE ID 351810117570001
LATITUDE 351810
LONGITUDE 1175700
ALTITUDE OF LAND-SURFACE DATUM 1945.00
ABOUT 1.25 MI SOUTHEAST OF CANTIL. DRILLED STOCK WATER-TABLE WELL. DIAM 8 IN, DEPTH 163 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM (READINGS ABOVE LAND SURFACE INDICATED BY "+")

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
OCT 03, 1929	+2.00	AUG 30, 1956	.80	JAN 14, 1976	87.90		
MAY 06, 1953	+2.00	FEB 26, 1958	+.80				

HIGHEST +2.00 OCT 03, 1929 MAY 06, 1953
LOWEST 87.90 JAN 14, 1976

LOCAL ID 030S037E25M001M
SITE ID 351738117580101
LATITUDE 351738
LONGITUDE 1175801
ALTITUDE OF LAND-SURFACE DATUM 1975.00
ABOUT 1 MI SOUTH OF CANTIL. DRILLED IRRIGATION WATER-TABLE WELL. DIAM 18 IN 0-282 FT, 12 IN 282-692 FT, PERFORATED 120-282, 288-692 FT. ALTITUDE OF LSD 1975 FT. RECORDS AVAILABLE 1953, 1958, 1976 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
MAR 17, 1953	29.32	FEB 26, 1958	33.88	JAN 14, 1976	148.50

HIGHEST 29.32 MAR 17, 1953
LOWEST 148.50 JAN 14, 1976

LOCAL ID 030S037E26D001M
SITE ID 351752117590501
LATITUDE 351752
LONGITUDE 1175905
ALTITUDE OF LAND-SURFACE DATUM 2034.00
ABOUT 1 MI SOUTHWEST OF CANTIL. DEPTH 77.7 FT. ALTITUDE OF LSD 2034 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
MAR 17, 1953	78.15	JUL 27, 1956	D

HIGHEST 78.15 MAR 17, 1953
LOWEST 78.15 MAR 17, 1953

LOCAL ID 030S037E26E001M
SITE ID 351745117590401
LATITUDE 351745
LONGITUDE 1175904
ALTITUDE OF LAND-SURFACE DATUM 2035.00
About 1.0 mile southwest of Cantil in Fremont Valley. Drilled irrigation water-table well. Diameter 14 inches, depth 485 feet, perforated 233-485 feet. Altitude of land-surface datum 2,305 feet. Water-level records available 1956, 1958-59.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
JUL 27, 1956	81.89	FEB 26, 1958	80.51	FEB 25, 1959	77.00 R

HIGHEST	77.00	FEB 25, 1959
LOWEST	81.89	JUL 27, 1956

LOCAL ID 030S037E26K001M
SITE ID 351737117583301
LATITUDE 351737
LONGITUDE 1175833
ALTITUDE OF LAND-SURFACE DATUM 2000.00
ABOUT 1 MI NORTHEAST OF RANCHO SECO. DRILLED UNUSED WATER-TABLE WELL. DIAM 12 IN, DEPTH 55 FT IN 1956.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
, 1917	60.00	JUL 27, 1956	49.46	FEB 26, 1958	52.38	JAN 13, 1976	D

HIGHEST	49.46	JUL 27, 1956
LOWEST	60.00	, 1917

LOCAL ID 030S037E26M002M
SITE ID 351726117590401
LATITUDE 351726
LONGITUDE 1175904
ALTITUDE OF LAND-SURFACE DATUM 2030.00
ABOUT 0.55 MI NORTHEAST OF RANCHO SECO. DESTROYED WELL. DIAM 12 IN, DEPTH 100 FT, PERFORATED 85-100 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
, 1952	65.00 R	JAN 01, 1952	65.00 R

HIGHEST	65.00	, 1952	JAN 01, 1952
LOWEST	65.00	, 1952	JAN 01, 1952

LOCAL ID 030S037E26M003M
SITE ID 351726117590402
LATITUDE 351726
LONGITUDE 1175904
ALTITUDE OF LAND-SURFACE DATUM 2030.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 01, 1952	65.00	R

LOCAL ID 030S037E26N001M
SITE ID 351725117590301
LATITUDE 351725
LONGITUDE 1175903
ALTITUDE OF LAND-SURFACE DATUM 2025.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 12, 1976	200.00	E

LOCAL ID 030S037E26R001M
SITE ID 351722117580401
LATITUDE 351722
LONGITUDE 1175804
ALTITUDE OF LAND-SURFACE DATUM 1985.00
.05 MILE WEST AND .15 MILE NORTH OF INTERSECTION OF NORTON AND MUNSEY ROADS. DRILLED WATER-TABLE WELL. DIAM 8 IN, DEPTH 246 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 14, 1976	140.18	TR

LOCAL ID 030S037E26R002M
SITE ID 351719117580801
LATITUDE 351719
LONGITUDE 1175808
ALTITUDE OF LAND-SURFACE DATUM 1985.00
NEAR NORTON AND MUNSEY INTERSECTION. DRILLED DOMESTIC WATER-TABLE WELL. DIAM 8 IN, DEPTH 170 FT, PERFORATED 90-170 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 14, 1976	141.15 T

LOCAL ID 030S037E26R003M
SITE ID 351718117580701
LATITUDE 351718
LONGITUDE 1175807
ALTITUDE OF LAND-SURFACE DATUM 1985.00
NEAR MUNSEY AND NORTON INTERSECTION. DRILLED DOMESTIC WATER-TABLE WELL. DIAM UNKNOWN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 14, 1976	143.50 T

LOCAL ID 030S037E26Z001M
SITE ID 351742117590401
LATITUDE 351742
LONGITUDE 1175904
ALTITUDE OF LAND-SURFACE DATUM 2034.00
ABOUT 1 MI NORTHEAST OF RANCHO SECO. DESTROYED WELL. DIAM 12 IN, DEPTH 350 FT IN 1917.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
, 1917	65.00	JAN 01, 1917	65.00

HIGHEST	65.00	, 1917	JAN 01, 1917
LOWEST	65.00	, 1917	JAN 01, 1917

LOCAL ID 030S037E27H001M
SITE ID 351744117591101
LATITUDE 351744
LONGITUDE 1175911
ALTITUDE OF LAND-SURFACE DATUM 2050.00
WEST OF NEURALIA ROAD. DRILLED WATER-TABLE WELL. DEPTH DRILLED 220 FT. ALTITUDE OF LSD 2050 FT.
RECORDS AVAILABLE 1953, 1956, 1958.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
MAR 12, 1953	87.00	R	JUL 27, 1956	91.49		FEB 26, 1958	94.14	

HIGHEST 87.00 MAR 12, 1953
LOWEST 94.14 FEB 26, 1958

LOCAL ID 030S037E27H002M
SITE ID 351741117590901
LATITUDE 351741
LONGITUDE 1175909
ALTITUDE OF LAND-SURFACE DATUM 2040.00
About 1 mile southwest of Cantil along Neuralia Road. Unused well. Diameter 8 inches, depth measured 252.3 feet in 1992. Altitude of land-surface datum 2,040 feet. Water-level records available 1973-76, 1978-1994-95. (discontinued).

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
FEB 15, 1973	170.79	S	FEB 13, 1979	229.85		MAR 26, 1986	233.35	S	APR 20, 1993	231.30	S
FEB 14, 1974	184.92		APR 17, 1980	241.17	S	FEB 23, 1987	224.54	S	APR 14, 1994	231.36	S
FEB 05, 1975	195.34		APR 16, 1981	245.86	S	MAR 29, 1988	220.29	S	APR 19, 1995	228.12	S
JAN 08, 1976	210.60		FEB 12, 1982	248.30	S	MAR 22, 1989	220.95	S	APR 15, 1996	219.80	S
18	210.60	S	APR 14, 1983	250.95	SS	MAR 12, 1990	225.74	S	MAR 05, 1997	212.81	S
MAR 08	220.37		MAR 07, 1984	251.70	S	APR 18, 1991	228.55	S			
MAR 28, 1978	222.74		MAR 26, 1985	248.01	S	APR 16, 1992	230.88	S			

HIGHEST 170.79 FEB 15, 1973
LOWEST 251.70 MAR 07, 1984

LOCAL ID 030S037E27P001M
SITE ID 351723117595001
LATITUDE 351723
LONGITUDE 1175950
ALTITUDE OF LAND-SURFACE DATUM 2060.00
ABOUT 0.6 MI NORTHWEST OF RANCHO SECO. DRILLED UNUSED WATER-TABLE WELL. DIAM 12 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
AUG 18, 1953	119.40	FEB 26, 1958	118.41

HIGHEST 118.41 FEB 26, 1958
LOWEST 119.40 AUG 18, 1953

LOCAL ID 030S037E28H001M
SITE ID 351701118002201
LATITUDE 351701
LONGITUDE 1180022
ALTITUDE OF LAND-SURFACE DATUM 2120.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 01, 1958	78.00 S

LOCAL ID 030S037E28J001M
SITE ID 351648118003401
LATITUDE 351648
LONGITUDE 1180034
ALTITUDE OF LAND-SURFACE DATUM 2100.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 01, 1958	125.00 S

LOCAL ID 030S037E34B001M
SITE ID 351712117593201
LATITUDE 351712
LONGITUDE 1175932
ALTITUDE OF LAND-SURFACE DATUM 2040.00
ABOUT 0.25 MI NORTHWEST OF RANCHO SECO. DRILLED DOMESTIC WATER-TABLE WELL. DIAM 12 IN, DEPTH 141 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
MAR 12, 1953	79.30

LOCAL ID 030S037E34F001M
SITE ID 351659117595201
LATITUDE 351659
LONGITUDE 1175952
ALTITUDE OF LAND-SURFACE DATUM 2030.00
ABOUT 0.45 MI WEST OF RANCHO SECO. DRILLED IRRIGATION WATER-TABLE WELL. DIAM 10 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
JUL 27, 1956	76.31	FEB 26, 1958	78.84

HIGHEST 76.31 JUL 27, 1956
LOWEST 78.84 FEB 26, 1958

LOCAL ID 030S037E34H001M
SITE ID 351655117590901
LATITUDE 351655
LONGITUDE 1175909
ALTITUDE OF LAND-SURFACE DATUM 2018.00
ABOUT 0.2 MI SOUTHEAST OF RANCHO SECO. DRILLED DOMESTIC WATER-TABLE WELL. DIAM 6 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
, 1952	47.00 R	JUL 27, 1956	67.55	JAN 08, 1976	181.89		
MAR 12, 1953	55.20	FEB 26, 1958	69.16				

HIGHEST 47.00 , 1952
LOWEST 181.89 JAN 08, 1976

LOCAL ID 030S037E34H002M
SITE ID 351659117591901
LATITUDE 351659
LONGITUDE 1175919
ALTITUDE OF LAND-SURFACE DATUM 2025.00
About 2 miles southwest of Cantil, 0.3 mile south of Munsey Road, and 0.1 mile west of Neuralia Road. Domestic water-table well. Diameter 12 inches, depth reported 456 feet. Altitude of land-surface datum 2,025 feet. Water-level records available 1978-79, 1982-84, 1986-93.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
SEP 13, 1978	233.50	S	APR 27, 1983	246.40	SR	FEB 23, 1987	235.65	S	MAR 20, 1990		P
FEB 13, 1979	234.64		MAR 07, 1984	247.37	S	MAR 29, 1988	116.40	TR	APR 16, 1992	225.80	SR
FEB 12, 1982	243.03	S	MAR 26, 1986	232.56	S	MAR 20, 1989	215.27	SR	APR 22, 1993		N

HIGHEST 232.56 MAR 26, 1986
LOWEST 247.37 MAR 07, 1984

LOCAL ID 030S037E34R001M
SITE ID 351630117591801
LATITUDE 351630
LONGITUDE 1175918
ALTITUDE OF LAND-SURFACE DATUM 2010.00
ABOUT 0.8 MI SOUTH AND 0.2 MI WEST OF MUNSEY AND NEURALIA ROADS. DRILLED IRRIGATION WATER-TABLE WELL. DIAM 16 IN, DEPTH 650 FT, CASED TO 603 FT, PERFORATED 160-603 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
FEB 15, 1974	147.80		FEB 06, 1975	173.40		MAR 29, 1978	.00	

HIGHEST .00 MAR 29, 1978
LOWEST 173.40 FEB 06, 1975

LOCAL ID 030S037E35D001M
SITE ID 351608117590401
LATITUDE 351608
LONGITUDE 1175904
ALTITUDE OF LAND-SURFACE DATUM 2020.00
SOUTHEAST OF SECTION-LINE ROAD INTERSECTION. DRILLED IRRIGATION WATER-TABLE WELL. DIAM 18 TO 12 IN, DEPTH 844 FT, CASED TO 844 FT, PERFORATED 120-282, 288-844 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 31, 1958	97.12	S	JAN 08, 1976		O

HIGHEST 97.12 JAN 31, 1958
LOWEST 97.12 JAN 31, 1958

LOCAL ID 030S037E35N001M
SITE ID 351632117590401
LATITUDE 351632
LONGITUDE 1175904
ALTITUDE OF LAND-SURFACE DATUM 2008
South of Cantil at the American Honda facility. Drilled unused well. Diameter 16 inches, depth 1,020 feet, perforated 442-882, 900-1020 feet. Altitude of land-surface datum 2,008 feet. Water-level records available 1986, 1993.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JUL 23, 1986	211.63	S	JUN 09, 1993	208.51	V

HIGHEST 208.51 JUN 09, 1993
LOWEST 211.63 JUL 23, 1986

LOCAL ID 030S037E35Q001M
SITE ID 351621117582101
LATITUDE 351621
LONGITUDE 1175821
ALTITUDE OF LAND-SURFACE DATUM 2015.
South of Cantil at the American Honda facility. Drilled unused well. Diameter 20 inches 0-408 feet, 12 inches 408-810 feet, depth 810 feet, perforated 246-408, 414-810 feet. Altitude of land-surface datum 2,015 feet. Water-level records available 1953, 1976, 1993.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
MAR 12, 1953	63.42	S	JAN 08, 1976	274.3	V	JUN 09, 1993	217.41	V

HIGHEST 63.42 MAR 12, 1953
LOWEST 274.3 JAN 08, 1976

LOCAL ID 030S037E36D001M
SITE ID 351701117575401
LATITUDE 351701
LONGITUDE 1175754
ALTITUDE OF LAND-SURFACE DATUM 1985.00
1.25 MILES SOUTHEAST OF NEURALIA AND MUNSEY ROAD INTERSECTION. DRILLED IRRIGATION WATER-TABLE WELL.
DIAM 16 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 08, 1976	165.10	S

LOCAL ID 030S037E36G001M
SITE ID 351659117571001
LATITUDE 351659
LONGITUDE 1175710
ALTITUDE OF LAND-SURFACE DATUM 1968.00
About 2 miles south of Cantil. Drilled domestic well in alluvium. Diameter 14 inches, depth 919 feet, perforated 12-52, 106-110, 138-144, 171-180, 238-250, 293-309, 418-424, 436-440, 446-450, 457-463, 767-787, 816-824, 832-838, 902-907, 916-919 feet. Altitude of land-surface datum 1,968 feet. Water-level records available 1917, 1929, 1953, 1958, 1960 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
, 1917		F	MAR 20, 1968	60.49	S	OCT 12, 1977	122.35		FEB 23, 1987	129.97	S
OCT 29, 1929	18.00	R	OCT 31	66.84	S	MAR 28, 1978	113.79		NOV 04	130.30	S
MAR 12, 1953	29.32		APR 14, 1969	61.57		OCT 16	123.84		MAR 29, 1988	129.23	S
JAN 31, 1958	33.31		SEP 18	70.70		FEB 12, 1979	117.66		MAR 20, 1989	129.66	S
MAR 10, 1960	40.62	R	MAR 17, 1970	66.49		OCT 24	126.86	SS	MAR 13, 1990	130.96	S
NOV 10	39.68		OCT 21	79.61	S	APR 17, 1980	148.40	SS	OCT 15	132.69	S
FEB 27, 1961	40.05		MAR 17, 1971	77.21	S	OCT 15	132.15	SS	MAR 22, 1991	132.21	S
NOV 14	48.84		OCT 28	82.37	S	APR 16, 1981	129.58	S	OCT 22	133.82	S
MAR 14, 1962	49.78		MAR 15, 1972	93.48	S	NOV 19	130.96	S	APR 17, 1992	133.99	
NOV 09	50.77		OCT 12	96.65		FEB 12, 1982	129.30	S	NOV 04	135.09	S
MAR 13, 1963	56.07	R	FEB 15, 1973	83.95		OCT 07	132.94	S	APR 21, 1993	135.25	V
NOV 07	53.48		OCT 02	102.02		APR 14, 1983	130.65	S	NOV 18	136.38	V
OCT 07, 1964	57.92		FEB 13, 1974	92.65		OCT 27	132.69	S	APR 14, 1994	136.34	S
MAR 16, 1965	54.87		OCT 23	104.53		MAR 07, 1984	133.05	S	OCT 27	143.60	V
OCT 18	60.39		FEB 06, 1975	99.76		OCT 30	134.99	S	APR 19, 1995	136.56	S
MAR 09, 1966	52.81		OCT 16	111.84		MAY 16, 1985	135.30	S	DEC 06	136.28	V
OCT 17	59.90		JAN 07, 1976	104.71		OCT 31	133.63	S	APR 15, 1996	135.58	S
APR 12, 1967	59.31		NOV 03	116.55		APR 23, 1986	131.80	S	NOV 14	134.71	S
OCT 11	65.32	S	MAR 08, 1977	112.08		OCT 23	131.76	S	MAR 05, 1997	135.11	S

HIGHEST 18.00 OCT 29, 1929
LOWEST 143.60 OCT 27, 1994

LOCAL ID 030S037E36H001M
SITE ID 351700117570801
LATITUDE 351700
LONGITUDE 1175708
ALTITUDE OF LAND-SURFACE DATUM 1985.00
ABOUT 2.2 MI EAST OF RANCHO SECO. DRILLED IRRIGATION WATER-TABLE WELL. DIAM UNKNOWN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 07, 1976	204.84	S

LOCAL ID 030S037E36H002M
SITE ID 351659117570301
LATITUDE 351659
LONGITUDE 1175703
ALTITUDE OF LAND-SURFACE DATUM 1968.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JUL 22, 1986	208.80 S

LOCAL ID 030S037E36K001M
SITE ID 351634117571001
LATITUDE 351634
LONGITUDE 1175710
ALTITUDE OF LAND-SURFACE DATUM 1990.00
ABOUT 2 MI SOUTHEAST OF CANTIL. DRILLED WATER-TABLE WELL. DIAM 14 IN, DEPTH 527 FT, PERFORATED 275-527 FT. ALTITUDE OF LSD 1990 FT. RECORDS AVAILABLE 1953, 1958.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
MAR 11, 1953	62.82	JAN 31, 1958	50.28

HIGHEST 50.28 JAN 31, 1958
LOWEST 62.82 MAR 11, 1953

LOCAL ID 030S037E36N001M
SITE ID 351621117575501
LATITUDE 351621
LONGITUDE 1175755
ALTITUDE OF LAND-SURFACE DATUM 2002.
South of Cantil at the American Honda facility. Drilled unused well. Diameter 20 inches 0-410 feet, 12 inches 410-590 feet, depth 590 feet, perforated 244-410, 416-590 feet. Altitude of land-surface datum 2,015 feet. Water-level records available 1953, 1958, 1967-70, 1976, 1993 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
MAR 11, 1953	53.90	APR 15, 1969	206.37	JUN 09, 1993	205.71 V	APR 19, 1995	197.43 S
JAN 31, 1958	71.52 S	MAR 17, 1970	220.02	NOV 18	203.16 V	APR 15, 1996	193.40 S
APR 12, 1967	184.60	JAN 08, 1976	257.9 V	APR 14, 1994	201.93 S	MAR 05, 1997	190.17 S

HIGHEST 53.90 MAR 11, 1953
LOWEST 257.9 JAN 08, 1976

LOCAL ID 030S037E36N002M
SITE ID 351622117575601
LATITUDE 351622
LONGITUDE 1175756
ALTITUDE OF LAND-SURFACE DATUM 2002

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
DEC 06, 1979	192

LOCAL ID 030S038E03B001M
SITE ID 352137117531201
LATITUDE 352137
LONGITUDE 1175312
ALTITUDE OF LAND-SURFACE DATUM 1927.00
ABOUT 0.5 MI NORTHWEST OF KOEHN LAKE. DRILLED DOMESTIC WATER-TABLE WELL. DIAM 10 IN, DEPTH 99 FT.
ALTITUDE OF LSD 1927. RECORDS AVAILABLE 1953, 1956.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
MAY 05, 1953	D	OCT 10, 1956	27.87 S

HIGHEST	27.87	OCT 10, 1956
LOWEST	27.87	OCT 10, 1956

LOCAL ID 030S038E03G001M
SITE ID 352111117525801
LATITUDE 352111
LONGITUDE 1175258
ALTITUDE OF LAND-SURFACE DATUM 1895.00
AT SALTDALE .65 MILE SOUTH-SOUTHEAST OF ROAD AND RAILROAD. DRILLED INDUSTRIAL WATER-TABLE WELL.
DIAM 12 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 19, 1976	53.33 S

LOCAL ID 030S038E03H001M
SITE ID 352114117524901
LATITUDE 352114
LONGITUDE 1175249
ALTITUDE OF LAND-SURFACE DATUM 1895.00
NEAR SALTDALE. UNUSED WATER-TABLE WELL. DIAM 12 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 19, 1976	51.10 S

LOCAL ID 030S038E03J001M
SITE ID 352110117524201
LATITUDE 352110
LONGITUDE 1175242
ALTITUDE OF LAND-SURFACE DATUM 1900.00
ABOUT 1 MI SOUTHEAST OF SALTDALE IN FREMONT VALLEY. DRILLED INDUSTRIAL WELL IN ALLUVIUM. DIAM 12 IN, DEPTH UNKNOWN. ALTITUDE OF LSD 1900 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
OCT 11, 1956	56.02	MAR 16, 1970	2.09	MAR 15, 1972	1.47	JAN 07, 1976	.00
APR 12, 1967	44.66	OCT 22	2.02	MAR 25, 1973	1.32		
MAR 20, 1968	46.70	MAR 17, 1971	1.68	FEB 13, 1974	1.10		
APR 15, 1969	6.17	OCT 28	1.64	FEB 06, 1975	1.28		

HIGHEST .00 JAN 07, 1976
LOWEST 56.02 OCT 11, 1956

LOCAL ID 030S038E03K001M
SITE ID 352057117530601
LATITUDE 352057
LONGITUDE 1175306
ALTITUDE OF LAND-SURFACE DATUM 1900.00
SOUTH OF SALTDALE. DRILLED UNUSED WATER-TABLE WELL IN ALLUVIUM OF QUATERNARY AGE. DIAM 40 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
MAY 05, 1953	3.20

LOCAL ID 030S038E03K002M
SITE ID 352101117530401
LATITUDE 352101
LONGITUDE 1175304
ALTITUDE OF LAND-SURFACE DATUM 1895.00
About 1.5 miles south of Saltdale. Drilled unused well. Diameter 10 inches, depth measured 24.7 feet in 1990. Altitude of land-surface datum 1,895 feet. Water-level records available 1976 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 16, 1976	52.30		FEB 17, 1982	16.95	S	MAR 29, 1988	14.51	S	APR 14, 1994	14.17	S
MAR 08, 1977	52.91		APR 15, 1983	16.36	S	MAR 20, 1989	15.98	S	APR 17, 1995	14.24	S
MAR 28, 1978	29.51		MAR 06, 1984	15.23	SV	MAR 12, 1990	14.50	S	APR 18, 1996	14.09	S
FEB 12, 1979	22.84		MAY 16, 1985	15.98	S	MAR 22, 1991	14.39	S	MAR 05, 1997	14.16	S
APR 23, 1980	18.44	S	MAR 27, 1986	15.86	S	APR 17, 1992	14.52	S			
APR 16, 1981	17.10	S	MAR 11, 1987	14.40	S	APR 21, 1993	14.36	S			

HIGHEST 14.09 APR 18, 1996
LOWEST 52.91 MAR 08, 1977

LOCAL ID 030S038E04D002M
SITE ID 352137117544801
LATITUDE 352137
LONGITUDE 1175448
ALTITUDE OF LAND-SURFACE DATUM 2005.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
AUG 18, 1979	100		JUN 10, 1996	106.04	S	JUN 13, 1996	106.07	S	JUL 09, 1997	106.29	S

HIGHEST 100 AUG 18, 1979
LOWEST 106.29 JUL 09, 1997

LOCAL ID 030S038E05A001M
SITE ID 352136117545101
LATITUDE 352136
LONGITUDE 1175451
ALTITUDE OF LAND-SURFACE DATUM 2000.00
ABOUT 1.7 MI WEST OF SALTDALE. DUG DOMESTIC WATER-TABLE WELL. DIAM 8 IN, DEPTH 140 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
APR 23, 1953	117.05		OCT 10, 1956	100.31		FEB 03, 1958	100.35		JAN 16, 1976	107.80	

HIGHEST 100.31 OCT 10, 1956
LOWEST 117.05 APR 23, 1953

LOCAL ID 030S038E05R001M
SITE ID 352049117545201
LATITUDE 352049
LONGITUDE 1175452
ALTITUDE OF LAND-SURFACE DATUM 1914.00
ABOUT 2 MI SOUTHWEST OF SALTDALE. DRILLED UNUSED WATER-TABLE WELL. DIAM 12 IN, DEPTH 31 FT IN 1953.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
MAY 05, 1953	14.32	OCT 10, 1956	14.50	FEB 14, 1958	14.89

HIGHEST 14.32 MAY 05, 1953
LOWEST 14.89 FEB 14, 1958

LOCAL ID 030S038E05R002M
SITE ID 352051117545101
LATITUDE 352051
LONGITUDE 1175451
ALTITUDE OF LAND-SURFACE DATUM 1914.00
SOUTHWEST OF SALTDALE. DRILLED UNUSED WATER-TABLE WELL. DIAM 12 IN, DEPTH 22.2 FT IN 1958, 24 FT IN 1976.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
FEB 14, 1958	13.10 S

LOCAL ID 030S038E05R003M
SITE ID 352049117545101
LATITUDE 352049
LONGITUDE 1175451
ALTITUDE OF LAND-SURFACE DATUM 1915.00
SOUTHWEST OF SALTDALE. DOMESTIC WATER-TABLE WELL. DIAM 6 IN, DEPTH 150 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 15, 1976	22.13

LOCAL ID 030S038E08E002M
SITE ID 352015117555402
LATITUDE 352015
LONGITUDE 1175554
ALTITUDE OF LAND-SURFACE DATUM 1980.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
FEB 14, 1958	26.09 S

LOCAL ID 030S038E08G001M
SITE ID 352018117552001
LATITUDE 352018
LONGITUDE 1175520
ALTITUDE OF LAND-SURFACE DATUM 1930.00
AT KOEHN SPRINGS. DUG DOMESTIC WATER-TABLE WELL. DIAM 48 IN, DEPTH 12.8 FT IN 1953.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
, 1917	F	MAY 05, 1953	2.38	FEB 14, 1958	3.31	JAN 15, 1976	D

HIGHEST 2.38 MAY 05, 1953
LOWEST 3.31 FEB 14, 1958

LOCAL ID 030S038E08J001M
SITE ID 352015117545401
LATITUDE 352015
LONGITUDE 1175454
ALTITUDE OF LAND-SURFACE DATUM 1900.00
ABOUT 2.4 MI SOUTHWEST OF SALTDALE. DRILLED UNUSED WATER-TABLE WELL. DIAM 20 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
MAY 05, 1953	F	OCT 10, 1956	F	FEB 14, 1958	F

HIGHEST --
LOWEST --

LOCAL ID 030S038E08K001M
SITE ID 352013117552001
LATITUDE 352013
LONGITUDE 1175520
ALTITUDE OF LAND-SURFACE DATUM 1930.00
ABOUT 2.75 MI SOUTHWEST OF SALTDALE. UNUSED WATER-TABLE WELL. DIAM 6 IN, DEPTH 32 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
OCT 10, 1956	1.01	FEB 14, 1958	1.42

HIGHEST	1.01	OCT 10, 1956
LOWEST	1.42	FEB 14, 1958

LOCAL ID 030S038E08K002M
SITE ID 352015117552101
LATITUDE 352015
LONGITUDE 1175521
ALTITUDE OF LAND-SURFACE DATUM 1925.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
OCT 10, 1956	7.20 S

LOCAL ID 030S038E08N001M
SITE ID 351952117554801
LATITUDE 351952
LONGITUDE 1175548
ALTITUDE OF LAND-SURFACE DATUM 2545.00
NEAR GYPSITE. DRILLED STOCK WATER-TABLE WELL IN ALLUVIUM OF QUATERNARY AGE. DIAM 10 IN, DEPTH 52 FT,
FILLED IN TO 44.5 FT JAN. 15, 1976.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
MAY 05, 1953	22.89	NOV 30, 1954	22.23	FEB 14, 1958	25.45 R		
MAR 17, 1954	21.90	MAR 02, 1955	22.50	JAN 15, 1976	D		

HIGHEST	21.90	MAR 17, 1954
LOWEST	22.89	MAY 05, 1953

LOCAL ID 030S038E17F001M
SITE ID 351937117555901
LATITUDE 351937
LONGITUDE 1175559
ALTITUDE OF LAND-SURFACE DATUM 1945.00
About 2 miles northeast of Cantil. Drilled irrigation water-table well in alluvium. Diameter 16 inches, depth 700 feet, depth cased 674 feet, perforated 179-674 feet. Altitude of land-surface datum 1945 feet. Records available 1968, 1976, 1979, 1982, 1987 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
MAR 11, 1968	102.	R	FEB 12, 1979	111.00	S	FEB 23, 1987	131.45	S			
JAN 13, 1976	107.13	S	FEB 17, 1982	121.56	S	MAR 30, 1988		P			

HIGHEST 102. MAR 11, 1968
LOWEST 131.45 FEB 23, 1987

LOCAL ID 030S038E18C001M
SITE ID 351947117563501
LATITUDE 351947
LONGITUDE 1175635
ALTITUDE OF LAND-SURFACE DATUM 2040.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JUL 17, 1972	125.00	

LOCAL ID 030S038E18R001M
SITE ID 351902117560001
LATITUDE 351902
LONGITUDE 1175600
ALTITUDE OF LAND-SURFACE DATUM 1960.00
NORTH OF PAPPAS AND MUNSEY INTERSECTION. DRILLED UNUSED WATER-TABLE WELL. DIAM 10 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 14, 1976	65.00	S

LOCAL ID 030S038E19F002M
SITE ID 351840117562901
LATITUDE 351840
LONGITUDE 1175629
ALTITUDE OF LAND-SURFACE DATUM 1960.00
NORTH OF CALIFORNIA CITY. UNUSED WATER-TABLE WELL IN ALLUVIUM. DIAM 6 IN, DEPTH 147.1 FT. ALTITUDE OF LSD 1960 FT. RECORDS AVAILABLE 1976, 1978 TO CURRENT YEAR.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 13, 1976	116.05	S	FEB 13, 1979	131.35		APR 16, 1981	146.37	S	APR 25, 1983		N
JUN 06, 1978	30.23	S	APR 23, 1980	145.10	S	FEB 17, 1982		O			

HIGHEST 30.23 JUN 06, 1978
LOWEST 146.37 APR 16, 1981

LOCAL ID 030S038E19F003M
SITE ID 351841117562801
LATITUDE 351841
LONGITUDE 1175628
ALTITUDE OF LAND-SURFACE DATUM 1960.00
EAST OF NORTON AND CANTIL INTERSECTION. UNUSED WATER-TABLE WELL. DIAM 8 IN, DEPTH 254 FT. ALTITUDE OF LSD 1960 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 13, 1976	66.33	S

LOCAL ID 030S038E19K001M
SITE ID 351830117562801
LATITUDE 351830
LONGITUDE 1175628
ALTITUDE OF LAND-SURFACE DATUM 1960.00
ABOUT 1.7 MI EAST OF CANTIL. DRILLED IRRIGATION WATER-TABLE WELL. DIAM 24 IN, DEPTH 828 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM (READINGS ABOVE LAND SURFACE INDICATED BY "+")

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
, 1917	+4.00		AUG 30, 1956	24.95		FEB 26, 1958	15.58		JAN 13, 1976	116.31	

HIGHEST +4.00 , 1917
LOWEST 116.31 JAN 13, 1976

LOCAL ID 030S038E19L001M
SITE ID 351829117563001
LATITUDE 351829
LONGITUDE 1175630
ALTITUDE OF LAND-SURFACE DATUM 1960.00
ABOUT 1.5 MI EAST OF CANTIL AND NORTON INTERSECTION. DOMESTIC WATER-TABLE WELL. DIAM 8 IN, DEPTH 400 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 13, 1976	112.32	S

LOCAL ID 030S038E19M001M
SITE ID 351832117565801
LATITUDE 351832
LONGITUDE 1175658
ALTITUDE OF LAND-SURFACE DATUM 1966.00
ABOUT 1.2 MI EAST OF CANTIL. DRILLED UNUSED WATER-TABLE WELL. DIAM 24 IN, DEPTH 1190 FT IN 1911, 880 FT IN 1917.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
, 1917	12.00		AUG 29, 1956	24.16		JAN 13, 1976		D			
MAY 05, 1953	105.50	P	FEB 26, 1958	21.91							

HIGHEST	12.00	, 1917
LOWEST	24.16	AUG 29, 1956

LOCAL ID 030S038E19N001M
SITE ID 351819117565601
LATITUDE 351819
LONGITUDE 1175656
ALTITUDE OF LAND-SURFACE DATUM 1952.00
NEAR INTERSECTION OF PAPPAS ROAD AND VALLEY ROAD. DRILLED IRRIGATION WATER-TABLE WELL. DIAM 14 IN, DEPTH 575 FT, CASED TO 505 FT, PERFORATED 179-505 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JUL 19, 1974	115.00	R	JAN 13, 1976	113.10	T

HIGHEST	113.10	JAN 13, 1976
LOWEST	115.00	JUL 19, 1974

LOCAL ID 030S038E20C002M
SITE ID 351851117552701
LATITUDE 351851
LONGITUDE 1175527
ALTITUDE OF LAND-SURFACE DATUM 1920.00
NORTHEAST OF MUNSEY AND PAPPAS ROAD. DRILLED DOMESTIC WATER-TABLE WELL. DIAM 8 IN, DEPTH 80 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 15, 1976	19.42 S

LOCAL ID 030S038E20C003M
SITE ID 351855117553701
LATITUDE 351855
LONGITUDE 1175537
ALTITUDE OF LAND-SURFACE DATUM 1925.00
SOUTH OF GYPSITE. DRILLED IRRIGATION WATER-TABLE WELL. DIAM 8 IN, DEPTH 205 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
FEB 14, 1958	7.10 S	JAN 14, 1976	65.05 S

HIGHEST 7.10 FEB 14, 1958
LOWEST 65.05 JAN 14, 1976

LOCAL ID 030S038E20C004M
SITE ID 351853117552501
LATITUDE 351853
LONGITUDE 1175525
ALTITUDE OF LAND-SURFACE DATUM 1925.00
SOUTH OF GYPSITE. DRILLED UNUSED ARTESIAN WELL. DIAM 12 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM (READINGS ABOVE LAND SURFACE INDICATED BY "+")

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
FEB 14, 1958	+3.24 S	JAN 15, 1976	54.89 S

HIGHEST +3.24 FEB 14, 1958
LOWEST 54.89 JAN 15, 1976

LOCAL ID 030S038E20F003M
SITE ID 351834117552601
LATITUDE 351835
LONGITUDE 1175227
ALTITUDE OF LAND-SURFACE DATUM 1918.00
SOUTH OF GYPSITE. DRILLED RECREATION WATER-TABLE WELL. DIAM UNKNOWN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 14, 1976	85.27	S

LOCAL ID 030S038E20H001M
SITE ID 351833117550701
LATITUDE 351833
LONGITUDE 1175507
ALTITUDE OF LAND-SURFACE DATUM 1907.00
SOUTH OF GYPSITE. DRILLED STOCK WATER-TABLE WELL IN ALLUVIUM OF QUATERNARY AGE. DIAM 16 IN, DEPTH 806.82 FT, CASED TO 806.82 FT, PERFORATED 223.65-806.82 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 14, 1976	75.67	S

LOCAL ID 030S038E20N001M
SITE ID 351819117554101
LATITUDE 351819
LONGITUDE 1175541
ALTITUDE OF LAND-SURFACE DATUM 1922.00
WEST OF KOEHN LAKE. DRILLED IRRIGATION WATER-TABLE WELL IN ALLUVIUM OF QUATERNARY AGE. DIAM 14 IN, DEPTH 677 FT, PERFORATED 195-677 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 14, 1976	87.39	S

LOCAL ID 030S038E21D001M
SITE ID 351853117544201
LATITUDE 351853
LONGITUDE 1175442
ALTITUDE OF LAND-SURFACE DATUM 1898.00
ON WEST EDGE OF KOEHN LAKE. DRILLED STOCK WATER-TABLE WELL. DIAM 8 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM (READINGS ABOVE LAND SURFACE INDICATED BY "+")

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
MAY 12, 1953	2.00	OCT 10, 1956	+.70	JAN 15, 1976	17.27

HIGHEST +.70 OCT 10, 1956
LOWEST 17.27 JAN 15, 1976

LOCAL ID 030S038E21N001M
SITE ID 351811117545201
LATITUDE 351811
LONGITUDE 1175452
ALTITUDE OF LAND-SURFACE DATUM 1913.00
WEST OF KOEHN LAKE. DRILLED DOMESTIC WATER-TABLE WELL. DIAM 12 IN, DEPTH 300 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
APR 27, 1957	6.52 S	APR 27, 1967	6.52 S	JAN 15, 1976	55.38 S

HIGHEST 6.52 APR 27, 1957 APR 27, 1967
LOWEST 55.38 JAN 15, 1976

LOCAL ID 030S038E27M001M
SITE ID 351740117535001
LATITUDE 351740
LONGITUDE 1175350
ALTITUDE OF LAND-SURFACE DATUM 1895.00
SOUTH TIP OF KOEHN LAKE. DRILLED UNUSED WATER-TABLE WELL. DIAM 2 IN, DEPTH 121 FT, CASED TO 121 FT, PERFORATED 119-121 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
JAN 22, 1976	56.10 SR	OCT 23, 1976	9.00 S

HIGHEST 9.00 OCT 23, 1976
LOWEST 9.00 OCT 23, 1976

LOCAL ID 030S038E27M002M
SITE ID 351740117535002
LATITUDE 351740
LONGITUDE 1175350
ALTITUDE OF LAND-SURFACE DATUM 1895.00
SOUTH TIP OF KOEHN LAKE. DRILLED UNUSED WATER-TABLE WELL. DIAM 2 IN, DEPTH 61 FT, CASED TO 61 FT, PERFORATED 59-61 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 22, 1976	56.05	SR	OCT 27, 1976	17.65	S

HIGHEST 17.65 OCT 27, 1976
LOWEST 17.65 OCT 27, 1976

LOCAL ID 030S038E28D001M
SITE ID 351759117544701
LATITUDE 351759
LONGITUDE 1175447
ALTITUDE OF LAND-SURFACE DATUM 1910.00
ABOUT 0.75 MI WEST OF KOEHN LAKE. DRILLED UNUSED WATER-TABLE WELL. DIAM 10 IN, DEPTH 152 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
MAY 07, 1953		F	FEB 12, 1958		F	JAN 06, 1976	47.29	

HIGHEST 47.29 JAN 06, 1976
LOWEST 47.29 JAN 06, 1976

LOCAL ID 030S038E28G001M
SITE ID 351741117542001
LATITUDE 351741
LONGITUDE 1175420
ALTITUDE OF LAND-SURFACE DATUM 1905.00
SOUTHWEST OF KOEHN LAKE. UNUSED WATER-TABLE WELL. DIAM 6 IN, DEPTH UNKNOWN. ALTITUDE OF LSD 1905 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 06, 1976	17.39	S

LOCAL ID 030S038E28N001M
SITE ID 351715117545101
LATITUDE 351715
LONGITUDE 1175451
ALTITUDE OF LAND-SURFACE DATUM 1925.00
NORTH OF MUNSEY ROAD, NEAR CANTIL. DRILLED OBSERVATION WELL IN ALLUVIUM OF QUATERNARY AGE.
DIAM 2 IN, DEPTH 121 FT, SAND POINT 119-121 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
JAN 23, 1976	72.12	FEB 12, 1979	69.83	APR 16, 1981	80.15 S	MAR 06, 1984	W
MAR 28, 1978	66.20	APR 25	74.23 S	FEB 17, 1982	80.42 S		
JUN 05	71.79	APR 17, 1980	74.90 S	APR 14, 1983	82.10 S		

HIGHEST 66.20 MAR 28, 1978
LOWEST 82.10 APR 14, 1983

LOCAL ID 030S038E28N002M
SITE ID 351715117545102
LATITUDE 351715
LONGITUDE 1175451
ALTITUDE OF LAND-SURFACE DATUM 1925.00
NORTH OF MUNSEY ROAD, NEAR CANTIL. DRILLED OBSERVATION WELL IN ALLUVIUM OF QUATERNARY AGE.
DIAM 2 IN, DEPTH 50 FT, SAND POINT 48-50 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
JAN 23, 1976	40.95	JUN 05, 1978	43.50	MAY 12, 1981	N		
MAR 28, 1978	43.07	APR 17, 1980	D				

HIGHEST 40.95 JAN 23, 1976
LOWEST 43.50 JUN 05, 1978

LOCAL ID 030S038E29A001M
SITE ID 351802117550001
LATITUDE 351802
LONGITUDE 1175500
ALTITUDE OF LAND-SURFACE DATUM 1909.00
Near southwest corner of Koehn Lake. Drilled domestic water-table well. Diameter 18 inches, depth unknown.
Altitude of land-surface datum 1,909 feet.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 15, 1976	56.55 S

LOCAL ID 030S038E29A002M
SITE ID 351802117550002
LATITUDE 351802
LONGITUDE 1175500
ALTITUDE OF LAND-SURFACE DATUM 1909.00
SOUTHWEST OF KOEHN LAKE. RECREATIONAL WATER-TABLE WELL. DIAM 14 IN, DEPTH UNKNOWN. ALTITUDE OF LSD 1909 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 15, 1976	58.94	S

LOCAL ID 030S038E29Q001M
SITE ID 351716117551501
LATITUDE 351716
LONGITUDE 1175515
ALTITUDE OF LAND-SURFACE DATUM 1935.00
ABOUT 1.35 MI SOUTHWEST OF SOUTH EDGE OF KOEHN LAKE. DRILLED DOMESTIC WATER-TABLE WELL. DIAM 6 IN, DEPTH 100 FT, PERFORATED 30-100 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 21, 1976	47.40	S

LOCAL ID 030S038E29Z001M
SITE ID 351802117555201
LATITUDE 351802
LONGITUDE 1175552
ALTITUDE OF LAND-SURFACE DATUM 1930.00
ABOUT 1.8 MI WEST OF SOUTHWEST EDGE OF KOEHN LAKE. DESTROYED WATER-TABLE WELL. DIAM 7 IN, DEPTH 600 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
, 1917		F

LOCAL ID 030S038E30B001M
SITE ID 351805117562701
LATITUDE 351805
LONGITUDE 1175627
ALTITUDE OF LAND-SURFACE DATUM 1940.00
ABOUT 1.7 MI SOUTHEAST OF CANTIL. DRILLED STOCK WATER-TABLE WELL. DIAM 12 IN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
OCT 03, 1929	F	MAY 06, 1953	F	FEB 26, 1958	F	JAN 13, 1976	D

HIGHEST --
LOWEST --

LOCAL ID 030S038E30B002M
SITE ID 351759117562701
LATITUDE 351759
LONGITUDE 1175627
ALTITUDE OF LAND-SURFACE DATUM 1935.00
ABOUT 1.75 MI SOUTHEAST OF CANTIL. DESTROYED WATER-TABLE WELL. DIAM 24 IN, DEPTH 2.6 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
, 1917	F

LOCAL ID 030S038E30D001M
SITE ID 351805117565601
LATITUDE 351805
LONGITUDE 1175656
ALTITUDE OF LAND-SURFACE DATUM 1940.00
SOUTHWEST OF KOEHN LAKE. UNUSED WATER-TABLE WELL. DIAM 12 IN, DEPTH 65.5 FT. ALTITUDE OF LSD 1940 FT

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 09, 1976	34.08 S

LOCAL ID 030S038E30E001M
SITE ID 351739117565801
LATITUDE 351739
LONGITUDE 1175658
ALTITUDE OF LAND-SURFACE DATUM 1950.00
ABOUT 1 MI SOUTH OF VALLEY ROAD AND 40 FT EAST OF PAPPAS ROAD. UNUSED WATER-TABLE WELL. DIAM 12 IN, DEPTH 260 FT. ALTITUDE OF LSD 1950 FT. RECORDS AVAILABLE 1917, 1929, 1953, 1958, 1974 TO CURRENT YEAR.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
, 1917		F	FEB 14, 1974	87.02	S	MAR 28, 1978	115.30		FEB 17, 1982		O
OCT 03, 1929		F	FEB 06, 1975	90.30		FEB 13, 1979	122.73		APR 25, 1983		N
MAY 13, 1953	3.61		JAN 09, 1976	90.33		APR 23, 1980	138.01	S			
JAN 31, 1958	4.15	S	MAR 08, 1977	120.43		APR 16, 1981	138.41	S			

HIGHEST 3.61 MAY 13, 1953
LOWEST 138.41 APR 16, 1981

LOCAL ID 030S038E30P001M
SITE ID 351714117563001
LATITUDE 351714
LONGITUDE 1175630
ALTITUDE OF LAND-SURFACE DATUM 1957.00
About 2 miles southeast of Cantil, east of intersection of Munsey and Neuralia Roads. Drilled unused water-table well in alluvium. Diameter 20 inches 0-150 feet, 12 inches 150-643 feet, original depth 643 feet, depth measured 330.5 feet in 1976, perforated 130-150, 153-643 feet. Altitude of land-surface datum 1,957 feet. Water-level records available 1953, 1958-59, 1974 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
APR 22, 1953	95.00	P	MAR 28, 1978	111.81		MAR 07, 1984	128.55	S	MAR 22, 1991	125.65	S
JAN 31, 1958	23.88	S	JUN 06	111.20		MAR 26, 1985	128.92	S	APR 16, 1992	126.79	
AUG 25, 1959	93.50	R	FEB 12, 1979	114.83		MAR 27, 1986	125.94	S	APR 21, 1993	127.90	V
FEB 14, 1974	106.70	S	APR 17, 1980	133.12	S	FEB 23, 1987	130.05	S	APR 14, 1994	129.42	S
FEB 06, 1975	126.50	S	APR 16, 1981	130.06	S	MAR 30, 1988	123.02	S	APR 17, 1995	128.68	S
JAN 06, 1976	106.09		FEB 17, 1982	130.89	SS	MAR 20, 1989	123.58	S	APR 15, 1996	127.35	S
MAR 08, 1977	135.49	S	APR 14, 1983	128.18	S	MAR 13, 1990	124.74	S	MAR 05, 1997	125.65	S

HIGHEST 23.88 JAN 31, 1958
LOWEST 133.12 APR 17, 1980

LOCAL ID 030S038E30Q001M
SITE ID 351714117562801
LATITUDE 351714
LONGITUDE 1175628
ALTITUDE OF LAND-SURFACE DATUM 1955.00
About 2 miles southeast of Cantil near intersection of Pappas and Munsey Roads. Drilled unused water-table well. Diameter 12 inches, depth measured 93.8 feet in 1958, 78.5 feet in 1976, 63.85 feet in 1990. Altitude of land-surface datum 1,955 feet. Water-level records available 1958, 1976, 1978 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
JAN 31, 1958	13.01	APR 23, 1980	61.15 S	MAR 27, 1986	45.85 S	APR 16, 1992	45.09 S
JAN 06, 1976	56.83	APR 16, 1981	61.16 S	FEB 23, 1987	46.78 S	APR 21, 1993	46.92 V
OCT 24	61.60	FEB 17, 1982	61.82 SS	MAR 30, 1988	48.27 S	APR 14, 1994	48.09 S
MAR 28, 1978	41.80	APR 14, 1983	32.28 S	MAR 20, 1989	49.57 S	APR 17, 1995	51.68 S
JUN 06	41.62	MAR 06, 1984	40.41 S	MAR 13, 1990	50.72 S	APR 15, 1996	50.20 S
FEB 13, 1979	55.19	MAR 26, 1985	43.14 S	MAR 22, 1991	51.77 S	MAR 05, 1997	51.01 S

HIGHEST 13.01 JAN 31, 1958
LOWEST 61.60 OCT 24, 1976

LOCAL ID 030S038E30R001M
SITE ID 351722117560801
LATITUDE 351722
LONGITUDE 1175608
ALTITUDE OF LAND-SURFACE DATUM 1955.00
ABOUT 2.25 MI SOUTHEAST OF CANTIL. DEPTH 80 FT. ALTITUDE OF LSD 1955 FT. RECORDS AVAILABLE 1917, 1953, 1958, 1976.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
, 1917	F	MAY 07, 1953	16.10	JAN 31, 1958	14.23	JAN 06, 1976	D

HIGHEST 14.23 JAN 31, 1958
LOWEST 16.10 MAY 07, 1953

LOCAL ID 030S038E30R002M
SITE ID 351723117560802
LATITUDE 351723
LONGITUDE 1175608
ALTITUDE OF LAND-SURFACE DATUM 1945.00
EAST OF MUNSEY AND NEURALIA INTERSECTION. DRILLED UNUSED WATER-TABLE WELL. DIAM 6 IN, DEPTH 37.5 FT. ALTITUDE OF LSD 1945 FT. JAN. 6, 1976, WELL FILLED IN TO 20.4 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 31, 1958	12.24	S	JAN 06, 1976		D

HIGHEST 12.24 JAN 31, 1958
LOWEST 12.24 JAN 31, 1958

LOCAL ID 030S038E31C001M
SITE ID 351712117562801
LATITUDE 351712
LONGITUDE 1175628
ALTITUDE OF LAND-SURFACE DATUM 1957.00
About 2 miles southeast of Cantil near intersection of Pappas and Munsey Roads. Drilled irrigation well. Diameter 16 inches, depth unknown. Altitude of land-surface datum 1,957 feet. Water-level records available 1961-62, 1967-68, 1976, 1978 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
OCT 06, 1961	163.0	RP	APR 23, 1980	142.90	V	MAR 30, 1988	114.83	S	APR 14, 1994	128.72	S
SEP 25, 1962	186.0	RP	APR 16, 1981	114.82	S	MAR 20, 1989	113.90	S	APR 19, 1995	140.30	S
APR 27, 1967	139.90	S	FEB 17, 1982	116.38	SS	MAR 13, 1990	115.47	S	APR 15, 1996	138.76	S
SEP 24, 1968	210.0	RP	APR 14, 1983	115.34	S	MAR 22, 1991	118.96	S	MAR 05, 1997	138.14	S
JAN 07, 1976	126.65	S	MAR 07, 1984	114.35	S	APR 17, 1992	120.19	S			
MAR 28, 1978	129.90	SR	MAR 27, 1986	112.68	S	APR 21, 1993	120.22	S			
FEB 12, 1979	115.17	S	MAR 12, 1987	114.21	S	NOV 18	126.63	V			

HIGHEST 112.68 MAR 27, 1986
LOWEST 142.90 APR 23, 1980

LOCAL ID 030S038E31F001M
SITE ID 351650117565401
LATITUDE 351650
LONGITUDE 1175654
ALTITUDE OF LAND-SURFACE DATUM 1980.00
ABOUT 2.6 MI SOUTHEAST OF RANCHO SECO. DRILLED IRRIGATION WATER-TABLE WELL. DIAM 16-12 IN, DEPTH 658 FT, 16-IN CSG 118-196 FT, 12-IN CSG 202-658 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
APR 22, 1953	125.00	P	JAN 30, 1958	50.50		JAN 07, 1976	214.10	

HIGHEST 50.50 JAN 30, 1958
LOWEST 214.10 JAN 07, 1976

LOCAL ID 030S038E31L001M
SITE ID 351634117562701
LATITUDE 351634
LONGITUDE 1175627
ALTITUDE OF LAND-SURFACE DATUM 1990.00
EAST OF NEURALIA AND MUNSEY INTERSECTION. DRILLED UNUSED WATER-TABLE WELL. DIAM 16 IN, DEPTH UNKNOWN. ALTITUDE OF LSD 1990 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 30, 1958	67.26	S

LOCAL ID 030S038E31Q001M
SITE ID 351633117560501
LATITUDE 351633
LONGITUDE 1175605
ALTITUDE OF LAND-SURFACE DATUM 1995.00
ABOUT 3 MI SOUTHEAST OF CANTIL. DRILLED IRRIGATION WELL IN ALLUVIUM. DIAM UNKNOWN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
APR 12, 1967	147.30		APR 27, 1967	147.30	S	MAR 17, 1971	.00	

HIGHEST .00 MAR 17, 1971
LOWEST 147.30 APR 12, 1967 APR 27, 1967

LOCAL ID 030S038E31Q002M
SITE ID 351633117562601
LATITUDE 351633
LONGITUDE 1175626
ALTITUDE OF LAND-SURFACE DATUM 1996

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JUL 22, 1986	240.44	S

LOCAL ID 030S038E32D001M
SITE ID 351701117555201
LATITUDE 351701
LONGITUDE 1175552
ALTITUDE OF LAND-SURFACE DATUM 1957.00
NORTHWEST OF KOEHN LAKE. DRILLED DOMESTIC WATER-TABLE WELL. DIAM 6 IN, DEPTH 300 FT. ALTITUDE OF LSD 1957 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 31, 1958	28.07	S

LOCAL ID 030S038E32D002M
SITE ID 351700117555501
LATITUDE 351700
LONGITUDE 1175555
ALTITUDE OF LAND-SURFACE DATUM 1965.00
EAST OF MUNSEY AND NEURALIA INTERSECTION. DRILLED UNUSED WATER-TABLE WELL. DIAM 12 IN, DEPTH 167 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 06, 1976	79.10	S

LOCAL ID 030S038E32D003M
SITE ID 351701117555202
LATITUDE 351701
LONGITUDE 1175552
ALTITUDE OF LAND-SURFACE DATUM 1956.00
Southeast of Munsey and Neuralia Road intersection. Drilled domestic water-table well in sand and gravel of Quaternary age. Diameter 6 inches, depth 250 feet, perforated 150-250 feet. Altitude of land-surface datum 1,956 feet.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
MAY 26, 1971	75.00	R

LOCAL ID 030S038E32E001M
SITE ID 351648117555801
LATITUDE 351648
LONGITUDE 1175558
ALTITUDE OF LAND-SURFACE DATUM 1970.00
ABOUT 0.5 MI SOUTH OF MUNSEY ROAD. DIAM 12 IN, DEPTH 107.4 FT IN 1958, 44 FT IN 1960. ALTITUDE OF LSD 1970 FT. RECORDS AVAILABLE 1953-60.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
MAY 07, 1953	25.14		NOV 15, 1955	34.09		NOV 22, 1957	38.67		DEC 02, 1959		D
MAR 17, 1954	28.79		MAR 19, 1956	34.74		JAN 31, 1958	37.15		FEB 26, 1960		D
NOV 30	30.21		NOV 27	36.37		NOV 05	40.49				
MAR 02, 1955	31.37	S	MAR 06, 1957	37.19		MAR 10, 1959	40.14				

HIGHEST 25.14 MAY 07, 1953
LOWEST 40.49 NOV 05, 1958

LOCAL ID 030S038E32G001M
SITE ID 351649117552201
LATITUDE 351649
LONGITUDE 1175522
ALTITUDE OF LAND-SURFACE DATUM 1949.00
ABOUT 3.75 MI SOUTHEAST OF RANCHO SECO. STOCK WATER-TABLE WELL. DIAM 20-12 IN, DEPTH 863 FT, 20-IN CSG 120-408 FT, 12-IN CSG 414-852 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
OCT 03, 1929		F	JAN 06, 1976	128.95	

HIGHEST 128.95 JAN 06, 1976
LOWEST 128.95 JAN 06, 1976

LOCAL ID 030S038E32N001M
SITE ID 351625117555501
LATITUDE 351625
LONGITUDE 1175555
ALTITUDE OF LAND-SURFACE DATUM 2000.00
ABOUT 3.3 MI SOUTHEAST OF RANCHO SECO. DRILLED UNUSED WATER-TABLE WELL. DIAM UNKNOWN, DEPTH 615 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
, 1917	13.00	JAN 01, 1917	13.00 R	JAN 06, 1976	D

HIGHEST	13.00	, 1917	JAN 01, 1917
LOWEST	13.00	, 1917	JAN 01, 1917

LOCAL ID 030S038E32Z001M
SITE ID 351624117553801
LATITUDE 351624
LONGITUDE 1175538
ALTITUDE OF LAND-SURFACE DATUM 1995.00
ABOUT 3.55 MI SOUTHEAST OF RANCHO SECO. DESTROYED WELL. DIAM UNKNOWN, DEPTH 300 FT IN 1917.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
, 1917	27.00	JAN 01, 1917	27.00 R

HIGHEST	27.00	, 1917	JAN 01, 1917
LOWEST	27.00	, 1917	JAN 01, 1917

LOCAL ID 030S038E34C001M
SITE ID 351707117531701
LATITUDE 351707
LONGITUDE 1175317
ALTITUDE OF LAND-SURFACE DATUM 1940.00
ABOUT 0.5 MI SOUTH OF KOEHN LAKE. DRILLED IRRIGATION WATER-TABLE WELL. DIAM 10 IN, DEPTH 367 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
MAY 07, 1953	6.00	FEB 12, 1958	7.80	FEB 18, 1958	7.80

HIGHEST	6.00	MAY 07, 1953	
LOWEST	7.80	FEB 12, 1958	FEB 18, 1958

LOCAL ID 030S038E34C002M
SITE ID 351710117531701
LATITUDE 351710
LONGITUDE 1175317
ALTITUDE OF LAND-SURFACE DATUM 1925.00
ABOUT 0.5 MI SOUTH OF KOEHN LAKE. DEPTH 52 FT. ALTITUDE OF LSD 1925 FT. RECORDS AVAILABLE 1953, 1958, 1976.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
MAY 13, 1953	8.90	S	FEB 12, 1958	12.89		JAN 06, 1976		D

HIGHEST 12.89 FEB 12, 1958
LOWEST 12.89 FEB 12, 1958

LOCAL ID 031S037E01H001M
SITE ID 351607117571001
LATITUDE 351607
LONGITUDE 1175710
ALTITUDE OF LAND-SURFACE DATUM 2015.00
ABOUT 2.5 MI SOUTH OF CANTIL. DRILLED UNUSED WATER-TABLE WELL. DIAM 14 IN, DEPTH 504 FT. ALTITUDE OF LSD 2015 FT. RECORDS AVAILABLE 1953, 1958, 1976, 1979-80.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
MAR 11, 1953	61.60		JAN 07, 1976	256.72		APR 17, 1980		W			
JAN 30, 1958	81.28		FEB 13, 1979	275.93							

HIGHEST 61.60 MAR 11, 1953
LOWEST 275.93 FEB 13, 1979

LOCAL ID 031S037E01M002M
SITE ID 351540117580001
LATITUDE 351540
LONGITUDE 1175800
ALTITUDE OF LAND-SURFACE DATUM 2042.00
SOUTH OF CANTIL. DRILLED UNUSED WATER-TABLE WELL. DIAM 16 IN, DEPTH 611 FT, PERFORATED 400-560 FT. ALTITUDE OF LSD 2042 FT. RECORDS AVAILABLE 1976, 1978-80.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 08, 1976	313.16		MAR 29, 1978	307.03		FEB 13, 1979	302.58		APR 17, 1980		W

HIGHEST 302.58 FEB 13, 1979
LOWEST 313.16 JAN 08, 1976

LOCAL ID 031S037E01R001M
SITE ID 351529117570001
LATITUDE 351529
LONGITUDE 1175700
ALTITUDE OF LAND-SURFACE DATUM 2050.
South of Cantil at the American Honda facility. Drilled commercial well. Diameter 20 inches 0-402 feet, 12 inches 402-468 feet, depth 468 feet, perforated 408-468 feet. Altitude of land-surface datum 2,055 feet. Water-level records available 1958, 1976, 1993.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
JAN 30, 1958	125.73 S	JAN 07, 1976	323.42 S	JUN 09, 1993	259.82 V

HIGHEST 125.73 JAN 30, 1958
LOWEST 323.42 JAN 07, 1976

LOCAL ID 031S037E01R002M
SITE ID 351534117570001
LATITUDE 351534
LONGITUDE 1175700
ALTITUDE OF LAND-SURFACE DATUM 2045
South of Cantil at American Honda facility. Drilled commerical well. Diameter unknown, depth cased 580 feet, perforated 416-580 feet. Altitude of land-surface datum 2,045 feet. Water-level records available 1986, 1991, 1993.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
SEP 23, 1986	292.40 S	JAN 29, 1991	273. R	JUN 09, 1993	250.91 V

HIGHEST 250.91 JUN 09, 1993
LOWEST 292.40 SEP 23, 1986

LOCAL ID 031S037E02D001M
SITE ID 351608117585401
LATITUDE 351608
LONGITUDE 1175854
ALTITUDE OF LAND-SURFACE DATUM 2030.00
SOUTHEAST OF MUNSEY AND NEURALIA INTERSECTION. DRILLED IRRIGATION WATER-TABLE WELL IN ALLUVIUM OF QUATERNARY AGE. DIAM 16 IN, DEPTH UNKNOWN. ALTITUDE OF LSD 2030 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
JAN 31, 1958	105.15	JAN 08, 1976	351.50

HIGHEST 105.15 JAN 31, 1958
LOWEST 351.50 JAN 08, 1976

LOCAL ID 031S037E02D002M
SITE ID 351609117590401
LATITUDE 351609
LONGITUDE 1175904
ALTITUDE OF LAND-SURFACE DATUM 2035.
South of Cantil at the American Honda facility. Drilled commercial well. Diameter 16 inches, depth 638 feet, perforated 398-638 feet. Altitude of land-surface datum 2,035 feet. Water level records available 1986, 1991, 1993.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JUL 23, 1986	300.42	S	JAN 29, 1991	275.	R	JUN 09, 1993	251.11	V

HIGHEST 251.11 JUN 09, 1993
LOWEST 300.42 JUL 23, 1986

LOCAL ID 031S037E02P001M
SITE ID 351532117584801
LATITUDE 351532
LONGITUDE 1175848
ALTITUDE OF LAND-SURFACE DATUM 2065.00
SOUTHEAST OF MUNSEY AND NEURALIA INTERSECTION. DRILLED IRRIGATION WATER-TABLE WELL IN ALLUVIUM OF QUATERNARY AGE. DIAM 18 TO 12 IN, DEPTH 380 FT, PERFORATED 120-324, 330-380 FT. ALTITUDE OF LSD 2065 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 30, 1958	147.32	S

LOCAL ID 031S037E02P002M
SITE ID 351527117584801
LATITUDE 351527
LONGITUDE 1175848
ALTITUDE OF LAND-SURFACE DATUM 2080.00
SOUTH OF CANTIL, ABOUT 0.27 MI EAST OF NEURALIA ROAD. DRILLED DOMESTIC WATER-TABLE WELL. DIAM 16 IN, DEPTH 453 FT, PERFORATED 400-560 FT. ALTITUDE OF LSD 2080 FT. RECORDS AVAILABLE 1969, 1976, 1978-80.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
MAR 10, 1969	260.00	R	MAR 29, 1978	302.90		APR 17, 1980		W			
JAN 08, 1976	301.35		FEB 13, 1979	303.18							

HIGHEST 260.00 MAR 10, 1969
LOWEST 303.18 FEB 13, 1979

LOCAL ID 031S037E02Z001M
SITE ID 351532117584802
LATITUDE 351532
LONGITUDE 1175848
ALTITUDE OF LAND-SURFACE DATUM 2065.00
ABOUT 1.7 MI SOUTHEAST OF RANCHO SECO. DESTROYED WELL. DIAM UNKNOWN, DEPTH 300 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
, 1917	100.00		JAN 01, 1917	100.00	R

HIGHEST	100.00	, 1917	JAN 01, 1917
LOWEST	100.00	, 1917	JAN 01, 1917

LOCAL ID 031S037E04J001M
SITE ID 351548118001601
LATITUDE 351548
LONGITUDE 1180016
ALTITUDE OF LAND-SURFACE DATUM 2050.00
In Fremont Valley about 4 miles southeast of Cantil, near intersection of Neuralia and Munsey Roads. Drilled irrigation water-table well. Diameter 16 inches, depth 806 feet, depth of hole 864 feet, perforated 306-806 feet. Altitude of land-surface datum 2,050 feet. Water-level records available 1974, 1976, 1979, 1982, 1986 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
FEB 01, 1974	130.00	S	APR 23, 1986	350.20	T	APR 18, 1991		O	APR 15, 1996	291.35	S
15	130.48		FEB 23, 1987	346.70	S	APR 16, 1992	307.81	S	MAR 05, 1997	285.09	S
JAN 08, 1976	191.22		MAR 29, 1988	330.6	T	APR 21, 1993	306.34	S			
FEB 13, 1979	270.70		MAR 20, 1989	319.37	S	APR 13, 1994	304.43	S			
FEB 12, 1982	330.89	S	MAR 13, 1990	315.64	S	APR 17, 1995	299.03	S			

HIGHEST	130.00	FEB 01, 1974
LOWEST	350.20	APR 23, 1986

LOCAL ID 031S037E04Q001M
SITE ID 351528118003201
LATITUDE 351528
LONGITUDE 1180032
ALTITUDE OF LAND-SURFACE DATUM 2100.00
In Fremont Valley about 4 miles southwest of Cantil and 2 miles south of Munsey Road. Unused well. Diameter 16 inches, depth unknown. Altitude of land-surface datum 2,100 feet. Water-level records available 1974-76, 1978 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
FEB 01, 1974	152.00	S	APR 17, 1980	360.98	SS	APR 23, 1986	401.50	T	APR 16, 1992	351.40	S
15	152.00		APR 16, 1981	376.43	S	FEB 23, 1987	397.60	S	APR 21, 1993	351.23	V
FEB 06, 1975	197.03		FEB 12, 1982	363.20	S	MAR 29, 1988	381.50	T	APR 13, 1994	347.49	S
JAN 08, 1976	213.15		APR 14, 1983	402.97	SS	MAR 21, 1989	379.05	T	APR 17, 1995	340.47	S
MAR 28, 1978	281.64	S	MAR 07, 1984	411.27	SS	MAR 13, 1990	368.25	V	APR 15, 1996	331.70	S
FEB 13, 1979	299.69		MAY 16, 1985	415.45	S	APR 18, 1991	355.74	S	MAR 05, 1997	325.31	V

HIGHEST 152.00 FEB 01, 1974 FEB 15, 1974
LOWEST 415.45 MAY 16, 1985

LOCAL ID 031S037E05M001M
SITE ID 351549118022001
LATITUDE 351549
LONGITUDE 1180220
ALTITUDE OF LAND-SURFACE DATUM 2150.00
31S/37E-5M1 M. DEPTH 205 FT IN 1958.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
, 1946	150.00	R	JAN 01, 1958	156.00	S	JAN 28, 1958	155.78	

HIGHEST 150.00 , 1946
LOWEST 156.00 JAN 01, 1958

LOCAL ID 031S037E07J001M
SITE ID 351449118022301
LATITUDE 351449
LONGITUDE 1180223
ALTITUDE OF LAND-SURFACE DATUM 2260.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JUL 26, 1974	290.00	

LOCAL ID 031S037E08A001M
SITE ID 351523118012301
LATITUDE 351523
LONGITUDE 1180123
ALTITUDE OF LAND-SURFACE DATUM 2145

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
SEP 23, 1986	424.94	S

LOCAL ID 031S037E08C001M
SITE ID 351514118015801
LATITUDE 351514
LONGITUDE 1180158
ALTITUDE OF LAND-SURFACE DATUM 2190.00
ABOUT 0.6 MI SOUTH OF CINCO. DRILLED UNUSED WELL IN ALLUVIUM. DIAM 16 IN, DEPTH 650 FT. ALTITUDE OF LSD 2190 FT. RECORDS AVAILABLE 1954-76.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
MAR 17, 1954	149.30		MAR 10, 1959	176.86		MAR 16, 1965	184.91		MAR 17, 1970	192.20	
NOV 30	170.66		FEB 26, 1960	177.16		OCT 18	185.64		OCT 21	193.52	
MAR 02, 1955	170.70		NOV 10	178.15		MAR 09, 1966	183.27		MAR 17, 1971	194.23	
NOV 15	171.49		FEB 27, 1961	178.44		OCT 17	187.12		OCT 27	196.17	
MAR 19, 1956	171.81		NOV 14	179.55		APR 12, 1967	187.98		MAR 15, 1972	197.37	
NOV 28	173.04		MAR 14, 1962	180.04		OCT 10	188.64		FEB 15, 1973	201.72	
MAR 06, 1957	174.68		NOV 09	181.13		MAR 20, 1968	189.40		FEB 15, 1974	213.40	
NOV 20	174.14		MAR 13, 1963	181.71		APR 02	189.36		FEB 06, 1975	245.50	
MAR 01, 1958	174.00	S	NOV 06	182.82		OCT 31	190.20		JAN 07, 1976	275.50	
04	174.30		MAR 04, 1964	183.37		APR 15, 1969	190.84		MAY 17, 1982		N
NOV 04	175.31		OCT 07	184.15		SEP 18	191.44				

HIGHEST 149.30 MAR 17, 1954
LOWEST 275.50 JAN 07, 1976

LOCAL ID 031S037E08N001M
SITE ID 351444118020001
LATITUDE 351444
LONGITUDE 1180200
ALTITUDE OF LAND-SURFACE DATUM 2225.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
DEC 20, 1973	260.00	

LOCAL ID 031S037E11Z001M
SITE ID 351503117583501
LATITUDE 351503
LONGITUDE 1175835
ALTITUDE OF LAND-SURFACE DATUM 2100.00
ABOUT 1.5 MILES EAST OF NEURALIA. DRILLED IRRIGATION WATER-TABLE WELL IN SAND OF QUATERNARY AGE.
DIAM 14 IN, DEPTH 384 FT, CASED TO 360 FT, PERFORATED 260-360 FT. ALTITUDE OF LSD 2100 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
MAR 19, 1969	256.00	R

LOCAL ID 031S037E11Z002M
SITE ID 351520117584801
LATITUDE 351520
LONGITUDE 1175848
ALTITUDE OF LAND-SURFACE DATUM 2085.00
ABOUT .5 MILE EAST OF NEURALIA. DRILLED IRRIGATION WATER-TABLE WELL IN SAND AND GRAVEL OF QUATERNARY AGE. DIAM 14 IN, DEPTH 336 FT, CASED TO 331 FT, PERFORATED 240-331 FT. ALTITUDE OF LSD 2085 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
FEB 24, 1969	260.00	R

LOCAL ID 031S037E12H001M
SITE ID 351501117570001
LATITUDE 351501
LONGITUDE 1175700
ALTITUDE OF LAND-SURFACE DATUM 2085.00
ABOUT 3.2 MI SOUTHEAST OF RANCHO SECO. DESTROYED WELL. DIAM 18 IN, DEPTH 341.7 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 30, 1958	155.54		OCT 28, 1960	207.00	P	FEB 15, 1974	326.44		MAR 08, 1977	329.66	
MAR 10, 1959	164.00	R	OCT 06, 1961	212.00	P	FEB 05, 1975	327.26				
SEP 30	197.00	P	SEP 25, 1962	231.00	P	JAN 08, 1976	330.30				

HIGHEST 155.54 JAN 30, 1958
LOWEST 330.30 JAN 08, 1976

LOCAL ID 031S037E12N001M
SITE ID 351434117575801
LATITUDE 351434
LONGITUDE 1175758
ALTITUDE OF LAND-SURFACE DATUM 2135.00
31S/37E-12N1 M. DEPTH 0 FT. ON JANUARY 30, 1958. ALTITUDE ABOUT 2,135 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
FEB 09, 1953	79.86	

LOCAL ID 031S037E12Z001M
SITE ID 351523117572901
LATITUDE 351523
LONGITUDE 1175729
ALTITUDE OF LAND-SURFACE DATUM 2050.00
ABOUT 4 MI SOUTHEAST OF CANTIL. DESTROYED WELL. DIAM UNKNOWN, DEPTH UNKNOWN.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
, 1917	96.00		JAN 01, 1917	96.00	R

HIGHEST	96.00	, 1917	JAN 01, 1917
LOWEST	96.00	, 1917	JAN 01, 1917

LOCAL ID 031S037E13A001M
SITE ID 351428117570001
LATITUDE 351428
LONGITUDE 1175700
ALTITUDE OF LAND-SURFACE DATUM 2135.00
31S/37E-13A1 M. LEWIS RYAN. ABOUT 5 MILES SOUTH OF CANTIL. DRILLED UNUSED WELL IN ALLUVIUM,
DIAMETER 12 INCHES. DEPTH 400 FT., LSD 2,135 FT. ABOVE MSL.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 01, 1958	184.00	S	NOV 09, 1962	224.81		DEC 14, 1964	241.05		MAR 09, 1966	248.86	
30	184.12		MAR 13, 1963	224.54		JAN 14, 1965	241.35		OCT 17	260.30	
NOV 05	187.70		NOV 08	232.30		FEB 14	241.49		APR 12, 1967	265.22	
MAR 10, 1959	187.55		MAR 04, 1964	229.37		MAR 16	242.25		OCT 11		O
MAR 02, 1960	196.05		JUL 12	235.93		APR 01	242.47		MAR 21, 1968		D
NOV 10	204.67		AUG 12	237.59		MAY 05	243.50		OCT 31		D
FEB 27, 1961	204.55		SEP 11	239.51		JUN 03	244.78		NOV 01		N
NOV 14	215.13		OCT 13	241.15		JUL 01	246.14				
MAR 14, 1962	213.65		NOV 11	242.39		OCT 18	250.83				

HIGHEST	184.00	JAN 01, 1958
LOWEST	265.22	APR 12, 1967

LOCAL ID 031S037E13B001M
SITE ID 351427117571801
LATITUDE 351427
LONGITUDE 1175718
ALTITUDE OF LAND-SURFACE DATUM 2140.00
31S/37E-13B1 M. DEPTH 400 FT. ON JANUARY 30, 1958 AND 205.3 FT. ON MAY 15, 1964. ALTITUDE ABOUT 2,140 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
, 1917	130.00		DEC 03, 1954	167.74		MAR 22, 1956	170.30		MAR 06, 1957	174.28	
JAN 22, 1953	155.84		MAR 02, 1955	167.13		NOV 27	173.41		MAR 04, 1958	177.80	
MAR 15, 1954	163.60		NOV 15	169.78		MAR 01, 1957	174.00	S	MAY 15, 1964		D

HIGHEST 130.00 , 1917
LOWEST 177.80 MAR 04, 1958

LOCAL ID 031S037E14L001M
SITE ID 351354117584401
LATITUDE 351354
LONGITUDE 1175844
ALTITUDE OF LAND-SURFACE DATUM 2179.00
31S/37E-14L1 M. DEPTH 250 FT. ALTITUDE IS 2,178.6 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
OCT 01, 1929	184.50	R	JAN 22, 1953	196.60	

HIGHEST 184.50 OCT 01, 1929
LOWEST 196.60 JAN 22, 1953

LOCAL ID 031S037E15L001M
SITE ID 351404117594801
LATITUDE 351404
LONGITUDE 1175948
ALTITUDE OF LAND-SURFACE DATUM 2189

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
MAY 08, 1980	237	

LOCAL ID 031S037E22Q001M
SITE ID 351249117593301
LATITUDE 351249
LONGITUDE 1175933
ALTITUDE OF LAND-SURFACE DATUM 2260.00
31S/37E-22Q1 M. DEPTH 500 FT. AND 269.5 FT. ON MARCH 2, 1960. ALTITUDE IS 2,260.0 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
SEP 30, 1929	253.00	R	MAR 02, 1955	262.93		MAR 06, 1957	268.97		MAR 10, 1959	274.83	
JAN 22, 1953	257.77		NOV 15	265.09		NOV 01	269.00	S	DEC 02	298.21	
MAR 15, 1954	260.15		MAR 22, 1956	265.99		22	269.32		MAR 02, 1960		D
DEC 03	262.14		NOV 27	267.91		NOV 05, 1958	273.73				

HIGHEST 253.00 SEP 30, 1929
LOWEST 298.21 DEC 02, 1959

LOCAL ID 031S037E26K001M
SITE ID 351212117572301
LATITUDE 351212
LONGITUDE 1175723
ALTITUDE OF LAND-SURFACE DATUM 2240.00
31S/37E-26K1 M. DEPTH 374 FT ON FEBRUARY 5, 1918 AND 244.7 FT. ON AUGUST 16, 1956. ALTITUDE IS 2,240.0 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
FEB 06, 1918	233.00		MAR 05, 1930	231.40	R	JAN 01, 1958	244.00	S			
SEP 30, 1929	231.00	R	AUG 16, 1956	237.75		30	244.36				

HIGHEST 231.00 SEP 30, 1929
LOWEST 244.36 JAN 30, 1958

LOCAL ID 031S037E28H001M
SITE ID 351224118001501
LATITUDE 351224
LONGITUDE 1180015
ALTITUDE OF LAND-SURFACE DATUM 2300.00
ABOUT 0.55 MI NORTH OF PHILLIPS ROAD. DRILLED UNUSED WATER-TABLE WELL. DIAM 14 IN, DEPTH 584.7 FT. ALTITUDE OF LSD 2300 FT. RECORDS AVAILABLE 1964-65.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JUN 11, 1964	233.87		OCT 13, 1964	234.50		JAN 14, 1965	233.40		MAY 05, 1965	237.01	
AUG 12	235.61		NOV 11	232.96		FEB 14	233.37		JUN 03	239.29	
SEP 11	233.67		DEC 15	233.08		APR 01	234.95		JUL 26	239.40	

HIGHEST 232.96 NOV 11, 1964
LOWEST 239.40 JUL 26, 1965

LOCAL ID 031S037E28P001M
SITE ID 351157118004701
LATITUDE 351157
LONGITUDE 1180047
ALTITUDE OF LAND-SURFACE DATUM 2340.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 28, 1958	266.33 S

LOCAL ID 031S037E28Q001M
SITE ID 351158118003001
LATITUDE 351158
LONGITUDE 1180030
ALTITUDE OF LAND-SURFACE DATUM 2330.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 28, 1958	243.43 S

LOCAL ID 031S037E30F001M
SITE ID 351225118025601
LATITUDE 351225
LONGITUDE 1180256
ALTITUDE OF LAND-SURFACE DATUM 2371.70
IN FREMONT VALLEY, ABOUT 12 MI NORTHEAST OF MOJAVE. DRILLED UNUSED WELL IN ALLUVIUM. DIAM 16 IN, DEPTH 331.4 FT. ALTITUDE OF LSD 2371.7 FT. RECORDS AVAILABLE 1917, 1929-30, 1958, 1967-76.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
OCT 03, 1917	304.00	APR 15, 1969	321.50	OCT 12, 1972	327.40	OCT 16, 1975	322.12
OCT 03, 1929	300.80 R	MAR 17, 1970	318.86	FEB 15, 1973	325.65	MAR 08, 1976	322.90
MAR 05, 1930	300.50 R	OCT 21	318.82	OCT 02	324.25	MAR 28, 1978	.00
JAN 28, 1958	307.20	MAR 17, 1971	318.87	FEB 12, 1974	320.95		
JAN 04, 1967	313.64	OCT 27	319.58	OCT 23	321.79		
MAR 20, 1968	327.82	MAR 15, 1972	319.99	FEB 06, 1975	321.42		

HIGHEST .00 MAR 28, 1978
LOWEST 327.82 MAR 20, 1968

LOCAL ID 031S037E32A001M
SITE ID 351153118011901
LATITUDE 351153
LONGITUDE 1180119
ALTITUDE OF LAND-SURFACE DATUM 2348.00
ABOUT 300 FT SOUTH OF PHILLIPS ROAD. DRILLED UNUSED WATER-TABLE WELL. DIAM 12 IN, DEPTH 349 FT. ALTITUDE OF LSD 2348 FT. RECORDS AVAILABLE 1917, 1929-30, 1953.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
, 1917	274.00	MAR 05, 1930	276.40 R	MAR 05, 1960	276.40		
OCT 01, 1929	276.20 R	JAN 23, 1953	D				

HIGHEST	274.00	, 1917	
LOWEST	276.40	MAR 05, 1930	MAR 05, 1960

LOCAL ID 031S037E32Z001M
SITE ID 351154118021501
LATITUDE 351154
LONGITUDE 1180215
ALTITUDE OF LAND-SURFACE DATUM 2380.00
DRILLED UNUSED WATER-TABLE WELL. DIAM 10 IN, DEPTH 349 FT. ALTITUDE OF LSD 2380 FT. RECORDS AVAILABLE 1917.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
OCT 03, 1917	307.00

LOCAL ID 031S037E33H001M
SITE ID 351131118001201
LATITUDE 351131
LONGITUDE 1180012
ALTITUDE OF LAND-SURFACE DATUM 2340.00
About 3 miles north of California City and south of Phillips Road. Drilled unused well. Diameter 16 inches, depth reported 535 feet. Altitude of land-surface datum 2,340 feet. Water-level records available 1956, 1958-59, 1961, 1964-65, 1967 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
JUN 19, 1956	230.00	JAN 14, 1965	267.61	MAR 17, 1971	279.30	FEB 12, 1976	276.78
JAN 28, 1958	274.48	APR 01	268.50	OCT 28	277.25	MAR 08, 1977	279.05
FEB 04, 1959	270.00	JAN 04, 1967	269.34	MAR 15, 1972	280.31	MAR 28, 1978	277.40
JUL 26, 1961	274.75 R	MAR 21, 1968	277.83	FEB 15, 1973	272.73	FEB 13, 1979	275.26
SEP 11, 1964	268.17	APR 15, 1969	277.59	FEB 12, 1974	275.16	OCT 24	279.39 S
OCT 13	268.23	MAR 17, 1970	279.10	FEB 05, 1975	273.70	APR 16, 1980	279.91 S
DEC 15	267.52	OCT 22	278.79	JAN 06, 1976	275.19	OCT 15	281.05 S

LOCAL ID 031S037E33H001M CONTINUED--

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
APR 16, 1981	278.85	S	MAY 16, 1985	278.19	S	OCT 18, 1989	280.77	S	NOV 18, 1993	277.80	V
NOV 19	279.40	S	OCT 31	278.42	S	MAR 14, 1990	278.98	S	APR 13, 1994	276.97	S
FEB 11, 1982	274.14	S	MAR 26, 1986	277.74	S	OCT 15	282.18	S	OCT 27	276.69	V
OCT 07	279.13	S	OCT 23	280.15	S	MAR 22, 1991	278.50	S	APR 17, 1995	275.88	S
APR 14, 1983	277.28	S	FEB 23, 1987	276.82	S	OCT 22	278.27	S	DEC 06	275.97	V
OCT 27	278.19	S	NOV 04	280.20	S	APR 16, 1992	277.09	S	APR 15, 1996	275.59	S
MAR 07, 1984	276.17	S	MAR 29, 1988	280.30	S	NOV 04	278.61	S	NOV 14	275.64	S
OCT 30	278.50	S	MAR 21, 1989	278.24	S	APR 21, 1993	277.04	V	MAR 05, 1997	275.30	S

HIGHEST 230.00 JUN 19, 1956
LOWEST 282.18 OCT 15, 1990

LOCAL ID 031S037E33Z001M
SITE ID 351153118002901
LATITUDE 351153
LONGITUDE 1180029
ALTITUDE OF LAND-SURFACE DATUM 2324.00
DRILLED UNUSED WATER-TABLE WELL. DIAM 14 IN, DEPTH UNKNOWN. ALTITUDE OF LSD 2324 FT. RECORDS AVAILABLE 1929-30.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
SEP 30, 1929	255.78	R	MAR 05, 1930	256.18	R

HIGHEST 255.78 SEP 30, 1929
LOWEST 256.18 MAR 05, 1930

LOCAL ID 031S037E34A001M
SITE ID 351112117595301
LATITUDE 351112
LONGITUDE 1175953
ALTITUDE OF LAND-SURFACE DATUM 2271.00
31S/37E-34A1 M. DEPTH 401.3 FT. ON JANUARY 22, 1953 AND 205.3 FT. ON JANUARY 29, 1958.
ALTITUDE IS 2,271.0 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
OCT 01, 1929	200.61	R	MAR 05, 1930	201.11	R	JAN 22, 1953	200.95		JAN 29, 1958		D

HIGHEST 200.61 OCT 01, 1929
LOWEST 201.11 MAR 05, 1930

LOCAL ID 031S037E35N001M
SITE ID 351104117590401
LATITUDE 351104
LONGITUDE 1175904
ALTITUDE OF LAND-SURFACE DATUM 2320.00
About 4 miles north of California City. Drilled unused water-table well. Diameter 16 inches, depth measured 429.2 feet in 1970, 405.25 feet in 1991. Altitude of land-surface datum 2,320 feet. Water-level records available 1953, 1958 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 22, 1953	230.79		JAN 04, 1967	247.00		MAR 08, 1977	256.98		NOV 04, 1987	258.13	S
APR 14	292.50	P	APR 12	247.33		OCT 12	256.00		MAR 29, 1988	257.74	S
JAN 30, 1958	244.08		OCT 11	248.12		MAR 28, 1978	254.20		MAR 21, 1989	257.72	S
MAR 01	244.00	S	MAR 21, 1968	248.17		OCT 16	255.89		OCT 18	258.19	S
04	243.72		OCT 31	249.30		FEB 13, 1979	255.37		MAR 14, 1990	258.69	S
MAR 10, 1959	246.04		APR 15, 1969	267.04		OCT 24	261.91	S	OCT 15	259.60	S
DEC 02	247.92		SEP 18	255.80		APR 16, 1980	258.98	S	APR 18, 1991	257.64	S
MAR 02, 1960	247.38		MAR 17, 1970	249.90		OCT 15	257.13	S	OCT 22	257.39	S
NOV 10	245.60		OCT 22	250.65		APR 16, 1981	256.72	S	APR 16, 1992	256.53	S
FEB 27, 1961	246.20		MAR 17, 1971	252.25		NOV 19	255.90	S	NOV 04	258.09	S
NOV 14	245.49		OCT 28	253.48		FEB 11, 1982	254.84	S	APR 21, 1993	257.54	V
MAR 15, 1962	245.18		MAR 15, 1972	253.28		OCT 07	256.66	S	NOV 18	257.46	V
NOV 09	243.73		OCT 12	254.09		APR 14, 1983	256.03	S	APR 13, 1994	257.44	S
MAR 13, 1963	244.82		FEB 14, 1973	253.25		OCT 27	256.04	S	OCT 27	256.75	S
NOV 07	244.41		OCT 02	254.01		MAR 07, 1984	256.04	S	APR 17, 1995	256.16	S
MAR 04, 1964	244.49		FEB 12, 1974	251.60		OCT 30	256.39	S	DEC 06	255.85	V
OCT 07	242.68		OCT 23	253.18		MAY 16, 1985	256.70	S	APR 15, 1996	255.24	S
MAR 16, 1965	242.54		FEB 05, 1975	251.40		OCT 31	256.36	S	NOV 14	254.86	S
OCT 18	244.00		OCT 16	255.45		MAR 26, 1986	255.35	S	MAR 05, 1997	254.60	S
MAR 09, 1966	244.09		FEB 12, 1976	254.98		OCT 23	257.32	S			
OCT 17	246.37		NOV 03	254.89		FEB 23, 1987	255.76	S			

HIGHEST 230.79 JAN 22, 1953
LOWEST 267.04 APR 15, 1969

LOCAL ID 031S038E06B001M
SITE ID 351611117561001
LATITUDE 351611
LONGITUDE 1175610
ALTITUDE OF LAND-SURFACE DATUM 2025.00
31S/38E-6B1 M. DEPTH 21.9 FT. ON JANUARY 31, 1958. ALTITUDE ABOUT 2,025 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 31, 1958		D

LOCAL ID 031S038E06E001M
SITE ID 351607117565601
LATITUDE 351607
LONGITUDE 1175656
ALTITUDE OF LAND-SURFACE DATUM 2015.00
About 3 miles southeast of Cantil, near intersection of Munsey and Neuralia Roads. Drilled irrigation water-table well. Diameter 16 inches, depth 700 feet, perforated 396-700 feet. Altitude of land-surface datum 2,015 feet. Water-level records available 1976 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 07, 1976	262.33	S	MAR 07, 1984	291.10	S	MAR 13, 1990		O	APR 14, 1994	228.59	S
DEC 07, 1978	285.69	S	MAR 26, 1985	279.49	S	20		O	APR 19, 1995	230.86	S
FEB 14, 1979	280.16		APR 23, 1986	269.00	S	MAR 22, 1991	234.03	S	APR 15, 1996	211.21	S
APR 17, 1980	299.06	SR	FEB 23, 1987	261.61	S	APR 17, 1992		O			
FEB 18, 1982	299.50	S	MAR 22, 1989	246.51	S	APR 21, 1993	223.25	S			

HIGHEST 211.21 APR 15, 1996
LOWEST 299.50 FEB 18, 1982

LOCAL ID 031S038E18P001M
SITE ID 351347117562601
LATITUDE 351347
LONGITUDE 1175626
ALTITUDE OF LAND-SURFACE DATUM 2225.00
About 6 miles north of California City near intersection of Phillips and Neuralia Roads. Drilled unused well in alluvium. Diameter 12 inches, depth measured 151.5 feet in 1974. Altitude of land-surface datum 2,225 feet. Water-level records available 1917, 1953, 1958, 1964-65, 1974-77, 1979-81, 1983 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
, 1917	140.00	R	JUL 26, 1965	147.21		APR 16, 1981	147.60	S	MAR 21, 1989	147.33	S
FEB 09, 1953	147.42		FEB 01, 1974	147.00	S	APR 14, 1983	149.17	S	MAR 13, 1990	147.35	S
JAN 30, 1958	147.22		15	147.32		MAR 07, 1984	147.59	S	APR 18, 1991	147.33	S
MAY 13, 1964	147.07		FEB 05, 1975	147.32		29	147.58	S	APR 16, 1992	147.04	
SEP 11	147.18		JAN 08, 1976		D	MAR 26, 1985	147.62	S	APR 22, 1993	147.33	S
OCT 13	147.07		MAR 08, 1977	147.30		MAR 26, 1986	132.74	S	APR 13, 1994	147.25	S
JAN 14, 1965	147.24		FEB 13, 1979	142.08		FEB 23, 1987	132.39	S	APR 17, 1995	147.34	S
APR 01	147.23		APR 17, 1980	147.38	S	MAR 29, 1988	147.26	S	MAR 05, 1997	147.46	S

HIGHEST 132.39 FEB 23, 1987
LOWEST 149.17 APR 14, 1983

LOCAL ID 031S038E31C001M
SITE ID 351149117562901
LATITUDE 351149
LONGITUDE 1175629
ALTITUDE OF LAND-SURFACE DATUM 2300.00
31S/38E-31C1 M. DEPTH 202.3 FT. ON JANUARY 30, 1958. ALTITUDE ABOUT 2,300 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
, 1917	230.00	R	FEB 09, 1953	199.90		JAN 01, 1958	198.00	S	JAN 30, 1958	197.66	

HIGHEST 197.66 JAN 30, 1958
LOWEST 199.90 FEB 09, 1953

LOCAL ID 032S036E21Q001M
SITE ID 350733118070801
LATITUDE 350733
LONGITUDE 1180708
ALTITUDE OF LAND-SURFACE DATUM 2798.89
About 6 miles northeast of Mojave. Drilled unused water-table well. Diameter 10 inches, depth drilled 1356 feet, cemented at 805 feet. Altitude of land-surface datum 2799 feet. Records available 1950, 1955-58.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
DEC 03, 1950	371.20	S	NOV 03, 1955	372.88	S	MAR 07, 1957	371.26	S	MAR 12, 1958	372.29	S
MAR 02, 1955	370.88	S	MAR 21, 1956	370.89	S	NOV 19	372.90	S			

HIGHEST 370.88 MAR 02, 1955
LOWEST 372.90 NOV 19, 1957

LOCAL ID 032S036E22B001M
SITE ID 350817118055601
LATITUDE 350817
LONGITUDE 1180556
ALTITUDE OF LAND-SURFACE DATUM 2710.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
JAN 27, 1958	605.00	R

LOCAL ID 032S036E22C001M
SITE ID 350819118060601
LATITUDE 350819
LONGITUDE 1180606
ALTITUDE OF LAND-SURFACE DATUM 2720.00
IN FREMONT VALLEY, ABOUT 7 MI NORTHEAST OF MOJAVE. DRILLED UNUSED WELL IN ALLUVIUM. DIAM 6 IN, DEPTH 640 FT. ALTITUDE OF LSD 2720 FT. RECORDS AVAILABLE 1958, 1967, 1969-77, 1980, 1982.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 27, 1958	612.40		OCT 21, 1970	621.30		MAR 25, 1973	621.75		MAR 08, 1977	624.00	
JAN 03, 1967	619.81		MAR 16, 1971	621.60		MAR 08, 1974	622.70		APR 16, 1980	626.50	T
APR 15, 1969	620.51		OCT 27	621.00		FEB 05, 1975	623.80		MAR 02, 1982		N
MAR 17, 1970	619.65		MAR 15, 1972	622.40		MAR 08, 1976	623.90				

HIGHEST 612.40 JAN 27, 1958
LOWEST 626.50 APR 16, 1980

LOCAL ID 032S036E23Q001M
SITE ID 350733118045701
LATITUDE 350733
LONGITUDE 1180457
ALTITUDE OF LAND-SURFACE DATUM 2670.00
IN FREMONT VALLEY, ABOUT 7 MI NORTHEAST OF MOJAVE. DRILLED UNUSED WELL IN ALLUVIUM. DIAM 12 IN, DEPTH 1000 FT. ALTITUDE OF LSD 2670 FT. RECORDS AVAILABLE 1952, 1958, 1967, 1969-70, 1973.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
DEC 03, 1952	569.60		JAN 03, 1967	579.57		OCT 21, 1970	581.80				
JAN 27, 1958	350.00		APR 15, 1969		O	MAR 25, 1973		N			

HIGHEST 350.00 JAN 27, 1958
LOWEST 581.80 OCT 21, 1970

LOCAL ID 032S037E01N001M
SITE ID 351012117585801
LATITUDE 351012
LONGITUDE 1175858
ALTITUDE OF LAND-SURFACE DATUM 2330.00
32S/37E-1N1 M. DEPTH 680 FT. AND 232 FT. ON FEBRUARY 27, 1961; AND 225 FT. ON JANUARY 4, 1967. ALTITUDE ABOUT 2,330 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
FEB 09, 1953	223.59		DEC 03, 1954	226.03		NOV 15, 1955	225.43		NOV 27, 1956	227.72	
MAR 15, 1954	226.48		MAR 02, 1955	225.16		MAR 22, 1956	225.28		MAR 06, 1957	229.98	

LOCAL ID 032S037E01N001M CONTINUED--

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
NOV 22, 1957	230.11		NOV 05, 1958	231.20		MAR 02, 1960	230.83		JAN 04, 1967		D
FEB 01, 1958	230.00	S	MAR 10, 1959	230.49		NOV 10	230.30				
03	229.71		DEC 02	231.14		FEB 27, 1961		D			

HIGHEST 223.59 FEB 09, 1953
LOWEST 231.20 NOV 05, 1958

LOCAL ID 032S037E02E001M
SITE ID 351039117590401
LATITUDE 351039
LONGITUDE 1175904
ALTITUDE OF LAND-SURFACE DATUM 2317.00
32S/37E-2E1 M. DEPTH 446 FT. IN 1917 AND 6.0 FT. ON JANUARY 22, 1953. ALTITUDE IS 2,316.5 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
, 1917	244.00		SEP 30, 1929	251.40	R	FEB 25, 1930	242.63	R

HIGHEST 242.63 FEB 25, 1930
LOWEST 244.00 , 1917

LOCAL ID 032S037E02F001M
SITE ID 351037117584101
LATITUDE 351037
LONGITUDE 1175841
ALTITUDE OF LAND-SURFACE DATUM 2320.00
32S/37E-2F1 M. DEPTH 205.9 FT. ON JANUARY 30, 1958. ALTITUDE ABOUT 2,320 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
FEB 09, 1953	232.41		JAN 30, 1958		D

HIGHEST 232.41 FEB 09, 1953
LOWEST 232.41 FEB 09, 1953

LOCAL ID 032S037E02N001M
SITE ID 351005117590301
LATITUDE 351005
LONGITUDE 1175903
ALTITUDE OF LAND-SURFACE DATUM 2330.00
32S/37E-2N1 M. DEPTH 89.8 FT. ON JANUARY 22, 1953. ALTITUDE IS 2,329.5 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
SEP 30, 1929	251.82	R	FEB 25, 1930	252.32	R	JAN 22, 1953		D

HIGHEST 251.82 SEP 30, 1929
LOWEST 252.32 FEB 25, 1930

LOCAL ID 032S037E04D001M
SITE ID 351100118011001
LATITUDE 351100
LONGITUDE 1180110
ALTITUDE OF LAND-SURFACE DATUM 2390.00
DRILLED IRRIGATION WATER-TABLE WELL. DIAM 16 IN, DEPTH 650 FT. ALTITUDE OF LSD 2390 FT.
RECORDS AVAILABLE 1953, 1958, 1961, 1967.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 23, 1953	301.06		JAN 28, 1958	335.19		JUL 26, 1961	312.16	R			
APR 17	365.00	P	FEB 04, 1959	323.00		JAN 04, 1967		D			

HIGHEST 301.06 JAN 23, 1953
LOWEST 335.19 JAN 28, 1958

LOCAL ID 032S037E04P001M
SITE ID 351012118003201
LATITUDE 351012
LONGITUDE 1180032
ALTITUDE OF LAND-SURFACE DATUM 2405.00
DRILLED IRRIGATION WATER-TABLE WELL. DIAM 16 IN, DEPTH 800 FT. ALTITUDE OF LSD 2405 FT.
RECORDS AVAILABLE 1958, 1961, 1976.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 01, 1952	265.00		JAN 28, 1958	339.90		JUL 26, 1961	318.58	R	SEP 06, 1976	326.24	

HIGHEST 265.00 JAN 01, 1952
LOWEST 339.90 JAN 28, 1958

LOCAL ID 032S037E04Q001M
SITE ID 351013118003301
LATITUDE 351013
LONGITUDE 1180033
ALTITUDE OF LAND-SURFACE DATUM 2388.70
DRILLED UNUSED WATER-TABLE WELL. DIAM 12 IN, DEPTH 426.7 FT ON JANUARY 23, 1953; 320 FT ON NOVEMBER 27, 1956; AND 204.9 FT ON MARCH 6, 1957. ALTITUDE OF LSD 2388.7 FT. RECORDS AVAILABLE 1929-30, 1953-57.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
SEP 30, 1929	303.20	R	JAN 23, 1953	302.98		MAR 02, 1955	310.64		NOV 27, 1956		D
FEB 25, 1930	304.30	R	MAR 15, 1954	315.55	S	MAR 22, 1956	317.87		MAR 06, 1957		D

HIGHEST 302.98 JAN 23, 1953
LOWEST 317.87 MAR 22, 1956

LOCAL ID 032S037E08E001M
SITE ID 350944118021501
LATITUDE 350944
LONGITUDE 1180215
ALTITUDE OF LAND-SURFACE DATUM 2470.00
DRILLED UNUSED WATER-TABLE WELL. DIAM 10 IN, DEPTH 410 FT IN 1917; 364 FT ON SEPTEMBER 18, 1952. ALTITUDE OF LSD 2470 FT. RECORDSAVAILABLE 1917, 1952.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
, 1917	370.00		JAN 01, 1917	370.00		SEP 18, 1952		D

HIGHEST 370.00 , 1917 JAN 01, 1917
LOWEST 370.00 , 1917 JAN 01, 1917

LOCAL ID 032S037E09Q001M
SITE ID 350919118003701
LATITUDE 350919
LONGITUDE 1180037
ALTITUDE OF LAND-SURFACE DATUM 2410.00
In Fremont Valley, about 12 miles northeast of Mojave. Drilled irrigation well. Diameter 16 inches, depth measured 711 feet in 1953. Altitude of land-surface datum 2410 feet. Records available 1953, 1956, 1958, 1961, 1967-84, 1988.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
APR 15, 1953	275.00		JAN 03, 1967	328.81	S	OCT 22, 1970	330.76	S	FEB 14, 1973	331.45	S
JUN 19, 1956	275.00	R	MAR 21, 1968	327.90	S	MAR 18, 1971	332.10	S	FEB 12, 1974	332.95	S
JAN 28, 1958	364.67	R	APR 15, 1969	328.72	S	OCT 28	332.44	S	FEB 05, 1975	333.25	S
JUL 26, 1961	327.91	R	MAR 17, 1970	328.96	S	MAR 16, 1972	331.59	S	FEB 12, 1976	333.65	S

LOCAL ID 032S037E09Q001M CONTINUED--

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
MAR 08, 1977	334.45	S	APR 16, 1980	337.80	S	APR 14, 1983	335.45	S	FEB 23, 1987	337.90	S
MAR 28, 1978	335.30	S	APR 16, 1981	336.07	S	MAR 07, 1984	335.79	S	MAR 29, 1988	341.69	S
FEB 14, 1979	335.87	S	FEB 11, 1982	335.70	S	APR 23, 1986	341.00	S	JUN 10, 1993		D

HIGHEST 275.00 APR 15, 1953 JUN 19, 1956
LOWEST 364.67 JAN 28, 1958

LOCAL ID 032S037E11N001M
SITE ID 350919117590301
LATITUDE 350919
LONGITUDE 1175903
ALTITUDE OF LAND-SURFACE DATUM 2375.00
About 2 miles north of California City. Drilled unused well. Diameter 16 inches, depth measured 600 feet in 1952. Altitude of land-surface datum 2,375 feet. Water-level records available 1953, 1958-79, 1980 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 22, 1953	268.09		MAR 13, 1963	280.96		MAR 17, 1970	280.19		MAR 07, 1984	286.31	S
MAY 01	389.00	P	NOV 08	279.97		OCT 22	281.06		MAY 16, 1985	287.26	S
JAN 30, 1958	280.18		MAR 04, 1964	279.67		MAR 17, 1971	280.68		MAR 26, 1986	291.68	S
MAR 01	279.00	S	OCT 07	279.79		OCT 28	281.54		FEB 23, 1987	292.38	S
04	279.08		MAR 16, 1965	279.47		MAR 15, 1972	281.38		MAR 30, 1988	293.24	S
NOV 05	280.77		OCT 18	279.61		FEB 14, 1973	281.79		MAR 21, 1989	292.96	S
MAR 10, 1959	281.91		MAR 09, 1966	279.32		FEB 12, 1974	282.26		MAR 14, 1990	293.86	V
DEC 02	281.63		OCT 17	279.66		FEB 05, 1975	283.17		APR 19, 1991	286.28	V
MAR 02, 1960	281.29		JAN 04, 1967	279.48		FEB 12, 1976	283.90		APR 16, 1992	297.36	
NOV 10	280.74		APR 12	279.48		MAR 07, 1977	284.15		APR 21, 1993	291.27	V
FEB 27, 1961	280.51		OCT 11	279.70		MAR 28, 1978	287.19		APR 13, 1994	291.66	S
JUL 26	275.58	R	MAR 21, 1968	279.86		APR 16, 1980	289.40	S	APR 18, 1995	291.88	S
NOV 14	280.32		OCT 31	280.27		APR 16, 1981	285.78	S	APR 15, 1996	292.40	S
MAR 15, 1962	280.02		APR 15, 1969	279.95		FEB 11, 1982	285.91	S	MAR 07, 1997	292.79	V
NOV 09	279.88		SEP 18	280.88		APR 14, 1983	286.16	S			

HIGHEST 268.09 JAN 22, 1953
LOWEST 297.36 APR 16, 1992

LOCAL ID 032S037E12M001M
SITE ID 350933117575001
LATITUDE 350933
LONGITUDE 1175750
ALTITUDE OF LAND-SURFACE DATUM 2350.00
In California City. Drilled unused well. Diameter 16 inches, depth measured 430.82 feet in 1967. Altitude of land-surface datum 2,350 feet. Water-level records available 1967 to current year.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 01, 1967	243.00	S	FEB 14, 1973	242.45		FEB 11, 1982	244.37	S	APR 19, 1991	246.70	S
04	243.22		FEB 12, 1974	242.35		APR 14, 1983	244.50	S	APR 16, 1992	247.10	S
MAR 20, 1968	242.72		FEB 05, 1975	242.82		MAR 07, 1984	244.76	S	APR 22, 1993	247.35	S
APR 15, 1969	242.13		FEB 12, 1976	243.05		MAY 16, 1985	245.01	S	APR 13, 1994	247.72	S
MAR 17, 1970	242.00		MAR 07, 1977	243.29		MAR 26, 1986	245.31	S	APR 18, 1995	247.53	S
OCT 22	242.30		MAR 28, 1978	243.33		FEB 23, 1987	244.87	S	APR 15, 1996	247.85	S
MAR 18, 1971	242.28		FEB 13, 1979	244.06		MAR 30, 1988	245.74	S	MAR 07, 1997	248.07	V
OCT 28	244.33		APR 16, 1980	244.17	S	MAR 24, 1989	245.87	S			
MAR 16, 1972	242.40		APR 16, 1981	244.32	S	MAR 14, 1990	246.60	S			

HIGHEST 242.00 MAR 17, 1970
LOWEST 248.07 MAR 07, 1997

LOCAL ID 032S037E12P001M
SITE ID 350922117574101
LATITUDE 350922
LONGITUDE 1175741
ALTITUDE OF LAND-SURFACE DATUM 2350.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS
APR 01, 1967	279.00	S

LOCAL ID 032S037E14N001M
SITE ID 350829117590201
LATITUDE 350829
LONGITUDE 1175902
ALTITUDE OF LAND-SURFACE DATUM 2400.00
32S/37E-14N1 M. DEPTH 685 FT. IN 1952. ALTITUDE ABOUT 2,400 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 01, 1958	323.00	S	JAN 16, 1965	296.33	R	FEB 20, 1965	295.38	R	MAR 20, 1965	293.88	R
30	323.39		22	295.50	R	MAR 03	294.10	R	APR 03	293.56	R
JUL 26, 1961	292.50	R	FEB 08	294.85	R	06	294.06	R	10	293.40	R
JAN 08, 1965	295.65	R	13	295.30	R	13	293.90	R	17	293.50	R

LOCAL ID 032S037E14N001M CONTINUED--

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
APR 24, 1965	293.60	R	MAY 08, 1965	297.97	S	JUN 16, 1965	296.78	S	JUL 11, 1965	298.94	S
26	294.35	S	13	298.30	S	17	297.22	S	13	297.70	R
27	295.21	S	20	298.50	S	18	297.46	S	14	297.10	R
28	295.86	S	JUN 02	298.39	S	19	297.76	S	17	296.36	R
30	296.50	S	07	298.44	S	24	298.53	S	21	296.00	R
MAY 01	296.78	S	08	297.62	R	28	298.63	S	28	295.98	R
02	296.88	S	12	296.10	R	30	298.70	S	AUG 06	296.05	R
03	296.98	S	14	295.89	R	JUL 03	298.75	S			
04	297.34	S	15	296.47	S	10	298.78	S			

HIGHEST 292.50 JUL 26, 1961
LOWEST 323.39 JAN 30, 1958

LOCAL ID 032S037E16R001M
SITE ID 350828118000901
LATITUDE 350828
LONGITUDE 1180009
ALTITUDE OF LAND-SURFACE DATUM 2440.00
DRILLED WITHDRAWAL WATER-TABLE WELL. DIAM 16 IN, DEPTH 686 FT. ALTITUDE OF LSD 2440 FT.
RECORDS AVAILABLE 1958, 1961, 1963.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
APR 30, 1953	390.00		JAN 28, 1958	385.59		JUL 26, 1961	347.12	R	OCT 28, 1965	345.70	
JUN 19, 1956	390.00		FEB 04, 1959	358.00		JUN 03, 1963	339.00	R			

HIGHEST 339.00 JUN 03, 1963
LOWEST 390.00 APR 30, 1953 JUN 19, 1956

LOCAL ID 032S037E19R001M
SITE ID 350734118022401
LATITUDE 350734
LONGITUDE 1180224
ALTITUDE OF LAND-SURFACE DATUM 2560.00
DRILLED UNUSED WATER-TABLE WELL. DIAM 8 IN, DEPTH 98 FT IN 1917; 60 FT ON JANUARY 27, 1958.
ALTITUDE OF LSD 2560 FT. RECORDS AVAILABLE 1917, 1958.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
, 1917		D	JAN 27, 1958		D

HIGHEST --
LOWEST --

LOCAL ID 032S037E22N001M
SITE ID 350737118000301
LATITUDE 350737
LONGITUDE 1180003
ALTITUDE OF LAND-SURFACE DATUM 2460.00
In California City, northeast of intersection of California City and Yorba Boulevards. Drilled irrigation well. Diameter 16 inches, depth reported 730 feet. Altitude of land-surface datum 2,460 feet. Water-level records available 1953-56, 1958-59, 1961-62, 1964-1995. Well destroyed.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
JAN 21, 1953	353		MAR 16, 1965	356.34	S	MAR 16, 1972	362.10	S	MAY 16, 1985	374.29	S
AUG 25, 1954	478.00	R	APR 01	356.11	S	FEB 14, 1973	363.85	S	MAR 26, 1986	370.95	S
OCT 04, 1955	459.00	R	OCT 18	358.17	S	FEB 15, 1974	363.00	S	MAR 11, 1987	371.19	S
JUN 19, 1956	472.	R	MAR 09, 1966	355.43	S	FEB 04, 1975	365.52	S	MAR 30, 1988	375.42	S
JAN 28, 1958	394.25	S	OCT 17	358.43	S	FEB 12, 1976	364.86	S	MAR 22, 1989		P
JAN 26, 1959	376.0	R	OCT 11, 1967	358.03	S	MAR 07, 1977	364.92	S	24	375.72	SR
JUN 22	380.5	R	MAR 21, 1968	357.63	S	MAR 28, 1978	369.15	S	MAR 12, 1990	377.88	S
JUL 26, 1961	357.5	R	OCT 31	359.72	S	FEB 14, 1979	367.93	S	APR 19, 1991	378.72	S
JUL , 1962	353.5	R	APR 15, 1969	360.54	S	APR 17, 1980	372.47	S	APR 15, 1992	379.10	
SEP 11, 1964	363.88	S	MAR 18, 1970	357.75	S	FEB 11, 1982	371.55	S	APR 22, 1993	380.81	S
OCT 13	359.74	S	OCT 22	362.72	S	APR 14, 1983	364.15	S	APR 13, 1994	381.92	S
JAN 14, 1965	359.79	S	MAR 18, 1971	361.08	S	MAR 08, 1984	362.34	S	APR 18, 1995		W

HIGHEST 353 JAN 21, 1953
LOWEST 478.00 AUG 25, 1954

LOCAL ID 032S037E22Z001M
SITE ID 350736117593501
LATITUDE 350736
LONGITUDE 1175935
ALTITUDE OF LAND-SURFACE DATUM 2418.00
32S/37E-22Z1 M. DEPTH 513 FT. ON FEBRUARY 6, 1918. ALTITUDE IS 2,418.0 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
FEB 06, 1918	312.00		SEP 30, 1929	304.20	R	FEB 26, 1930	304.80	R

HIGHEST 304.20 SEP 30, 1929
LOWEST 312.00 FEB 06, 1918

LOCAL ID 032S037E23N001M
SITE ID 350735117590201
LATITUDE 350735
LONGITUDE 1175902
ALTITUDE OF LAND-SURFACE DATUM 2415.00
32S/37E-23N1 M. ALTITUDE ABOUT 2,415 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
APR 15, 1953	401.00 P	JAN 30, 1958	353.23	SEP , 1962	314.00 R		
JAN 01, 1958	353.00 S	JUL 26, 1961	312.25 R	JAN 03, 1967	295.00		

HIGHEST 295.00 JAN 03, 1967
LOWEST 353.23 JAN 30, 1958

LOCAL ID 032S037E24N001M
SITE ID 350743117575701
LATITUDE 350743
LONGITUDE 1175757
ALTITUDE OF LAND-SURFACE DATUM 2385.00
32S/37E-24N1 M. DEPTH OVER 480 FT. ON MARCH 2, 1955 AND 266.3 FT. ON MARCH 6, 1957. ALTITUDE ABOUT 2,385 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
JAN 23, 1953	251.83	DEC 03, 1954	266.61	OCT 05, 1955	271.58	NOV 27, 1956	275.68
MAR 15, 1954	262.01	MAR 02, 1955	264.24	MAR 22, 1956	271.90	MAR 06, 1957	D

HIGHEST 251.83 JAN 23, 1953
LOWEST 275.68 NOV 27, 1956

LOCAL ID 032S037E24N002M
SITE ID 350735117575601
LATITUDE 350735
LONGITUDE 1175756
ALTITUDE OF LAND-SURFACE DATUM 2383.00
32S/37E-24N2 M. DEPTH 337 FT. IN 1917. ALTITUDE IS 2,383.0 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
, 1917	242.00	SEP 04, 1929	238.00 R	MAY 17, 1952	248.00

HIGHEST 238.00 SEP 04, 1929
LOWEST 248.00 MAY 17, 1952

LOCAL ID 032S037E26G001M
SITE ID 350707117583301
LATITUDE 350707
LONGITUDE 1175833
ALTITUDE OF LAND-SURFACE DATUM 2405.00
EAST OF NEURALIA ROAD AND NORTH OF REDWOOD BLVD. DRILLED IRRIGATION WELL. DIAM 16 IN, DEPTH 553 FT. ALTITUDE OF LSD 2405 FT. RECORDS AVAILABLE 1953-54, 1956, 1958-59, 1961, 1965, 1975.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
JAN 21, 1953	300.62	AUG 23, 1954	380.00	JUN 22, 1959	376.00 R	SEP 16, 1975	320.00
APR 15	360.00	JUN 18, 1956	326.00	JUL 27, 1961	338.50 P		
APR 22, 1954	365.00	JUL 15, 1958	378.00	OCT 28, 1965	302.10		

HIGHEST 300.62 JAN 21, 1953
LOWEST 380.00 AUG 23, 1954

LOCAL ID 032S037E26G002M
SITE ID 350707117583302
LATITUDE 350707
LONGITUDE 1175833
ALTITUDE OF LAND-SURFACE DATUM 2388.00
EAST OF NEURALIA ROAD AND NORTH OF REDWOOD BLVD. DRILLED UNUSED WELL. DIAM 8 IN, DEPTH UNKNOWN. ALTITUDE OF LSD 2388 FT. RECORDS AVAILABLE 1917, 1929-30.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
, 1917	268.00	NOV 23, 1929	268.80 R	MAR 05, 1930	268.80 R

HIGHEST 268.00 , 1917
LOWEST 268.80 NOV 23, 1929 MAR 05, 1930

LOCAL ID 032S037E26M001M
SITE ID 350701117590401
LATITUDE 350701
LONGITUDE 1175904
ALTITUDE OF LAND-SURFACE DATUM 2420
In California City. Drilled unused water-table well. Diameter 16 inches, depth 598 feet. Altitude of land-surface datum 2420 feet. Records available 1955, 1958-59, 1961-63, 1965, 1969, 1971.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
OCT 07, 1955	346.66 S	JUL 18, 1961	327.10 R	OCT 28, 1965	324.2 R		
JAN 29, 1958	351.98 S	SEP 13, 1962	324 R	SEP 17, 1969	336 R		
JUN 22, 1959	349.00 R	JUL 30, 1963	314 R	JUN 16, 1971	395.81 S		

HIGHEST 314 JUL 30, 1963
LOWEST 395.81 JUN 16, 1971

LOCAL ID 032S038E10P001M
SITE ID 350928117531801
LATITUDE 350928
LONGITUDE 1175318
ALTITUDE OF LAND-SURFACE DATUM 2475.00
32S/38E-10P1 M. DEPTH 200.0 FT. ON APRIL 15, 1953 AND 168.9 FT. ON JANUARY 29, 1958. ALTITUDE ABOUT 2,475 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
APR 15, 1953	177.04	JAN 29, 1958	D

HIGHEST 177.04 APR 15, 1953
LOWEST 177.04 APR 15, 1953

LOCAL ID 032S038E10P002M
SITE ID 350924117531801
LATITUDE 350924
LONGITUDE 1175318
ALTITUDE OF LAND-SURFACE DATUM 2475.00

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS
JAN 01, 1958	179.00 S

LOCAL ID 032S038E20D001M
SITE ID 350816117554301
LATITUDE 350816
LONGITUDE 1175543
ALTITUDE OF LAND-SURFACE DATUM 2330.00
32S/38E-20D1 M. DEPTH 90 FT. IN 1917 AND 97.7 FT. ON JANUARY 29, 1958. ALTITUDE 2,330 FT.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL MS	DATE	WATER LEVEL MS
, 1917	D	JAN 29, 1958	D

HIGHEST --
LOWEST --

LOCAL ID 032S038E30G001M
SITE ID 350720117561901
LATITUDE 350720
LONGITUDE 1175619
ALTITUDE OF LAND-SURFACE DATUM 2360.00
NORTH OF INTERSECTION OF CALIFORNIA CITY BLVD AND S COLLEGE BLVD. DRILLED UNUSED WELL. DIAM 12 IN, DEPTH 240 FT. ALTITUDE OF LSD 2360 FT. RECORDS AVAILABLE 1951, 1953-54, 1958.

WATER LEVELS IN FEET BELOW LAND SURFACE DATUM

DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS	DATE	WATER LEVEL	MS
APR 11, 1951	222.14		FEB 09, 1953	227.30		DEC 03, 1954		D			
NOV 15	221.75		MAR 15, 1954	236.32		JAN 29, 1958		D			

HIGHEST 221.75 NOV 15, 1951
LOWEST 236.32 MAR 15, 1954

APPENDIX E
GEOLOGIC CROSS SECTIONS

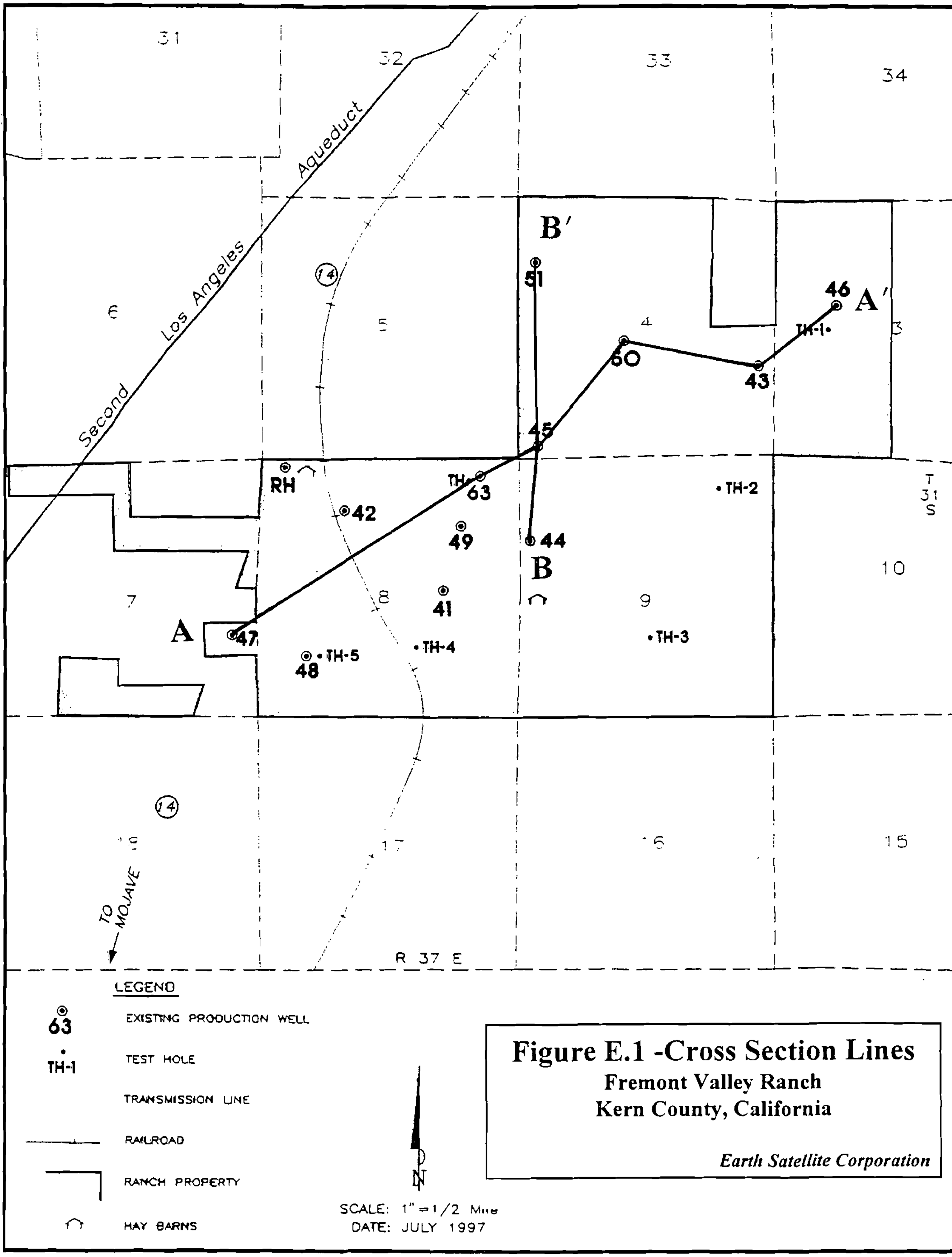


Figure E.1 -Cross Section Lines
Fremont Valley Ranch
Kern County, California

Earth Satellite Corporation

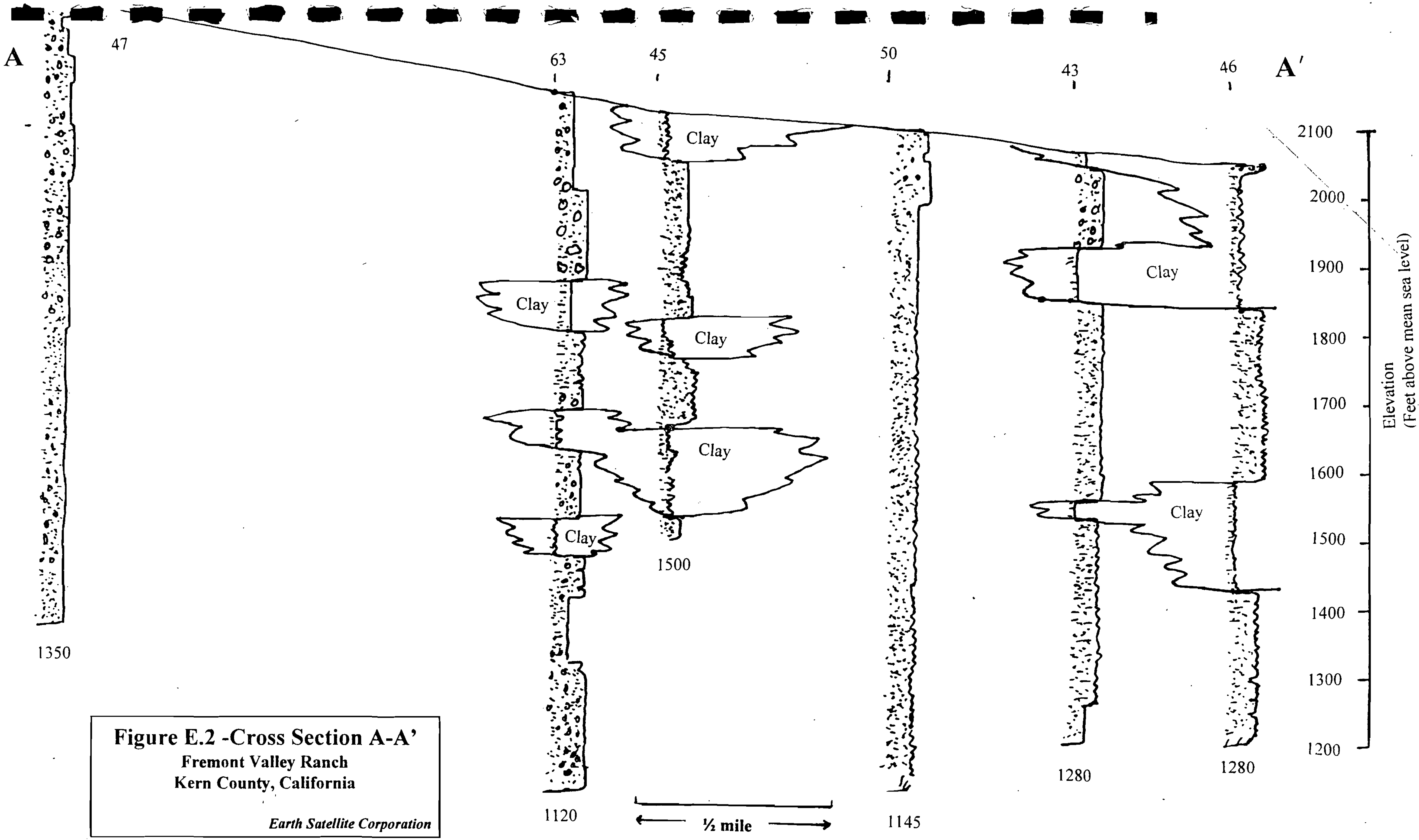


Figure E.2 -Cross Section A-A'
Fremont Valley Ranch
Kern County, California

Earth Satellite Corporation

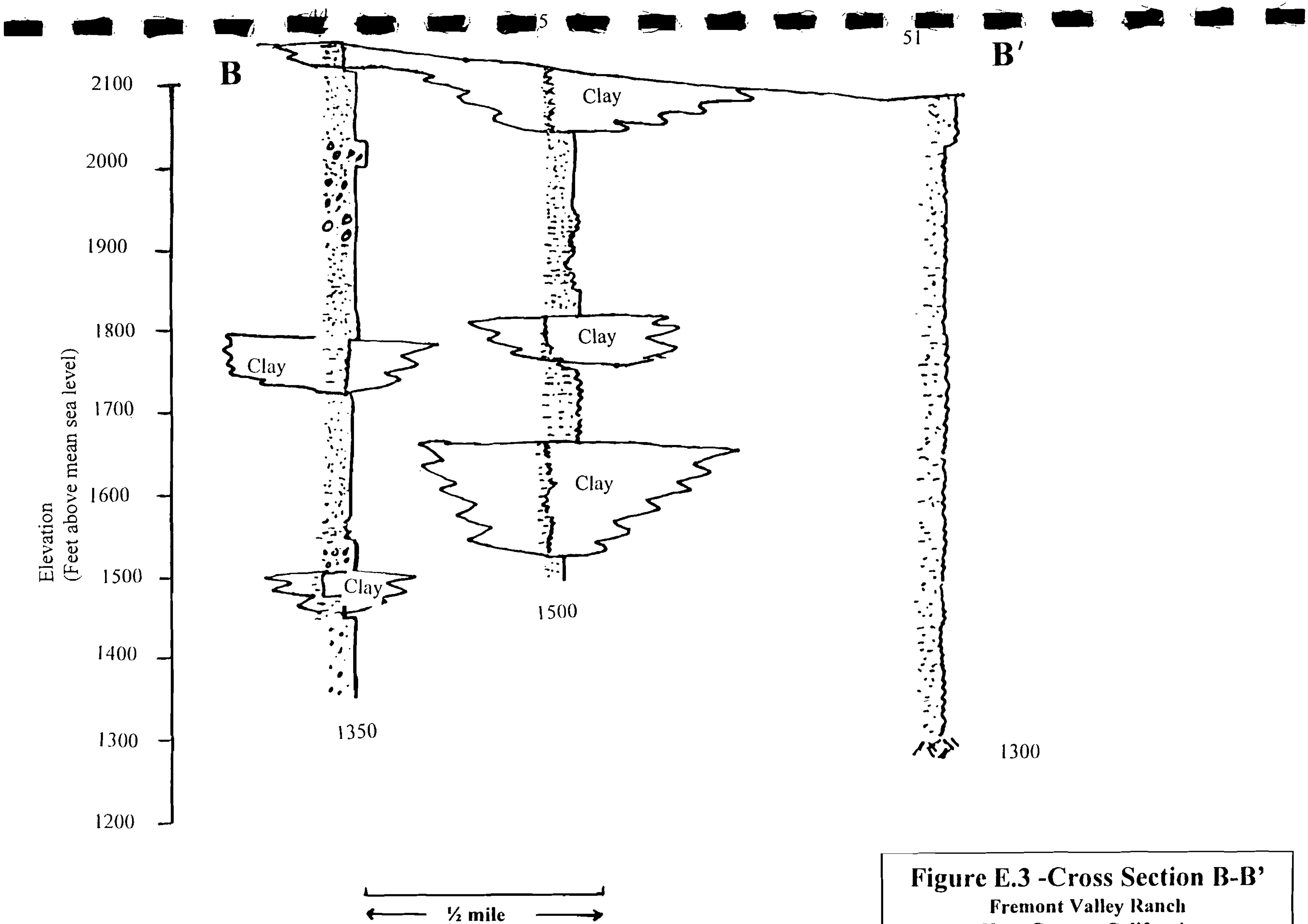


Figure E.3 -Cross Section B-B'
Fremont Valley Ranch
Kern County, California

Earth Satellite Corporation

APPENDIX F
STUDY AREAS & POTENTIOMETRIC SURFACE MAPS

FREMONT VALLEY STUDY AREA

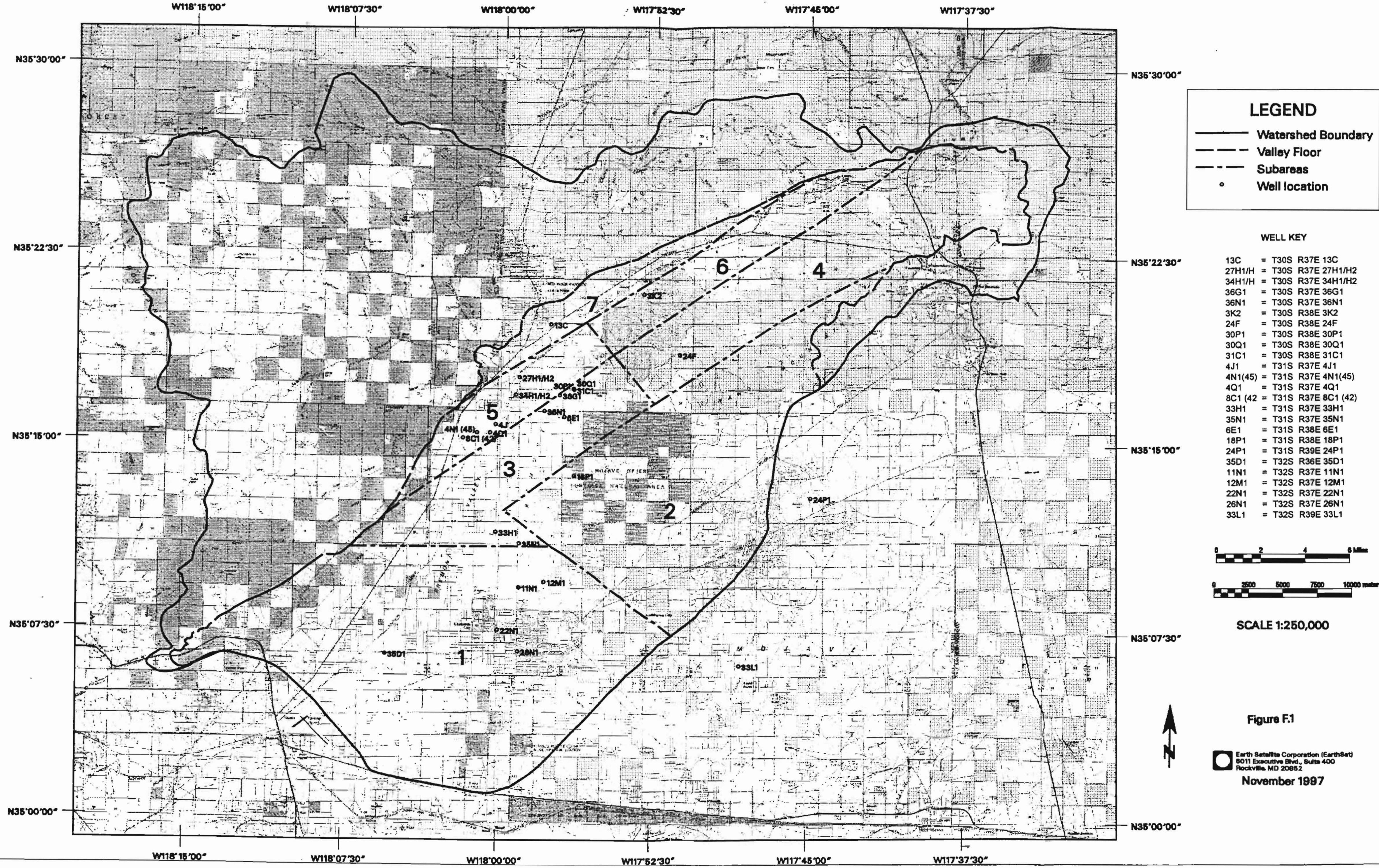
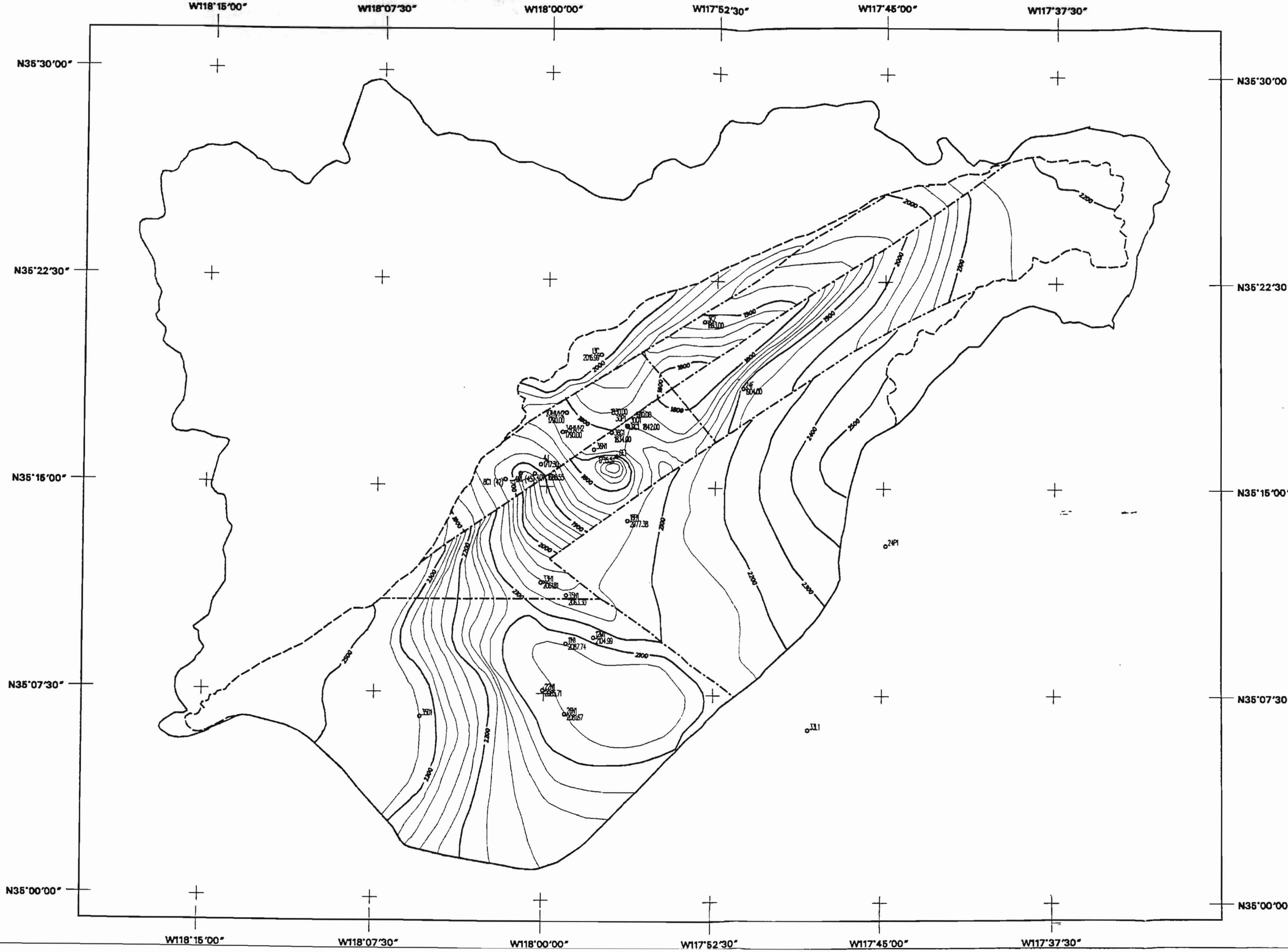


Figure F.1

FREMONT VALLEY STUDY AREA: POTENTIOMETRIC SURFACE 1985



LEGEND

- Watershed Boundary
- Valley Floor
- Subareas

WELL KEY

13C	=	T30S R37E 13C
27H1/H	=	T30S R37E 27H1/H2
34H1/H	=	T30S R37E 34H1/H2
36G1	=	T30S R37E 36G1
36N1	=	T30S R37E 36N1
3K2	=	T30S R38E 3K2
24F	=	T30S R38E 24F
30P1	=	T30S R38E 30P1
30Q1	=	T30S R38E 30Q1
31C1	=	T30S R38E 31C1
4J1	=	T31S R37E 4J1
4N1(45)	=	T31S R37E 4N1(45)
4Q1	=	T31S R37E 4Q1
8C1 (42	=	T31S R37E 8C1 (42)
33H1	=	T31S R37E 33H1
35N1	=	T31S R37E 35N1
6E1	=	T31S R38E 6E1
18P1	=	T31S R38E 18P1
24P1	=	T31S R39E 24P1
35D1	=	T32S R36E 35D1
11N1	=	T32S R37E 11N1
12M1	=	T32S R37E 12M1
22N1	=	T32S R37E 22N1
26N1	=	T32S R37E 26N1
33L1	=	T32S R39E 33L1

0 2 4 6 Miles

0 5 10 Km

SCALE 1:250,000

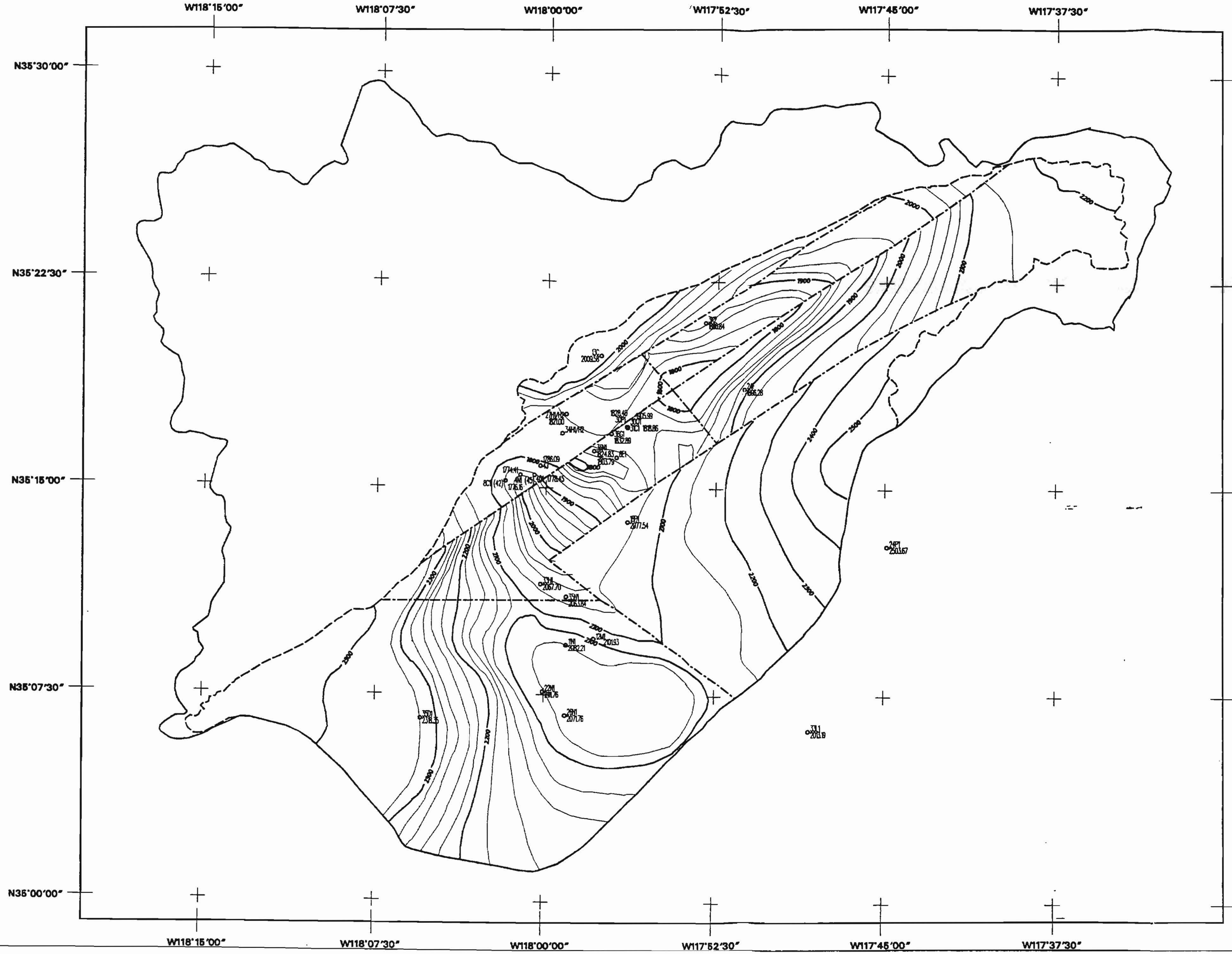
N

Figure F.2

Earth Satellite Corporation (EarthSat)
6011 Executive Blvd., Suite 400
Rockville, MD 20852

November 1997

FREMONT VALLEY STUDY AREA: POTENTIOMETRIC SURFACE 1997



LEGEND

- Watershed Boundary
- Valley Floor
- Subareas

WELL KEY

13C	=	T30S R37E 13C
27H1/H	=	T30S R37E 27H1/H2
34H1/H	=	T30S R37E 34H1/H2
36G1	=	T30S R37E 36G1
36N1	=	T30S R37E 36N1
3K2	=	T30S R38E 3K2
24F	=	T30S R38E 24F
30P1	=	T30S R38E 30P1
30Q1	=	T30S R38E 30Q1
31C1	=	T30S R38E 31C1
4J1	=	T31S R37E 4J1
4N1(45)	=	T31S R37E 4N1(45)
4Q1	=	T31S R37E 4Q1
8C1 (42	=	T31S R37E 8C1 (42)
33H1	=	T31S R37E 33H1
35N1	=	T31S R37E 35N1
6E1	=	T31S R38E 6E1
18P1	=	T31S R38E 18P1
24P1	=	T31S R39E 24P1
35D1	=	T32S R36E 35D1
11N1	=	T32S R37E 11N1
12M1	=	T32S R37E 12M1
22N1	=	T32S R37E 22N1
26N1	=	T32S R37E 26N1
33L1	=	T32S R39E 33L1

0 2 4 8 Miles

0 5 10 Km

SCALE 1:250,000

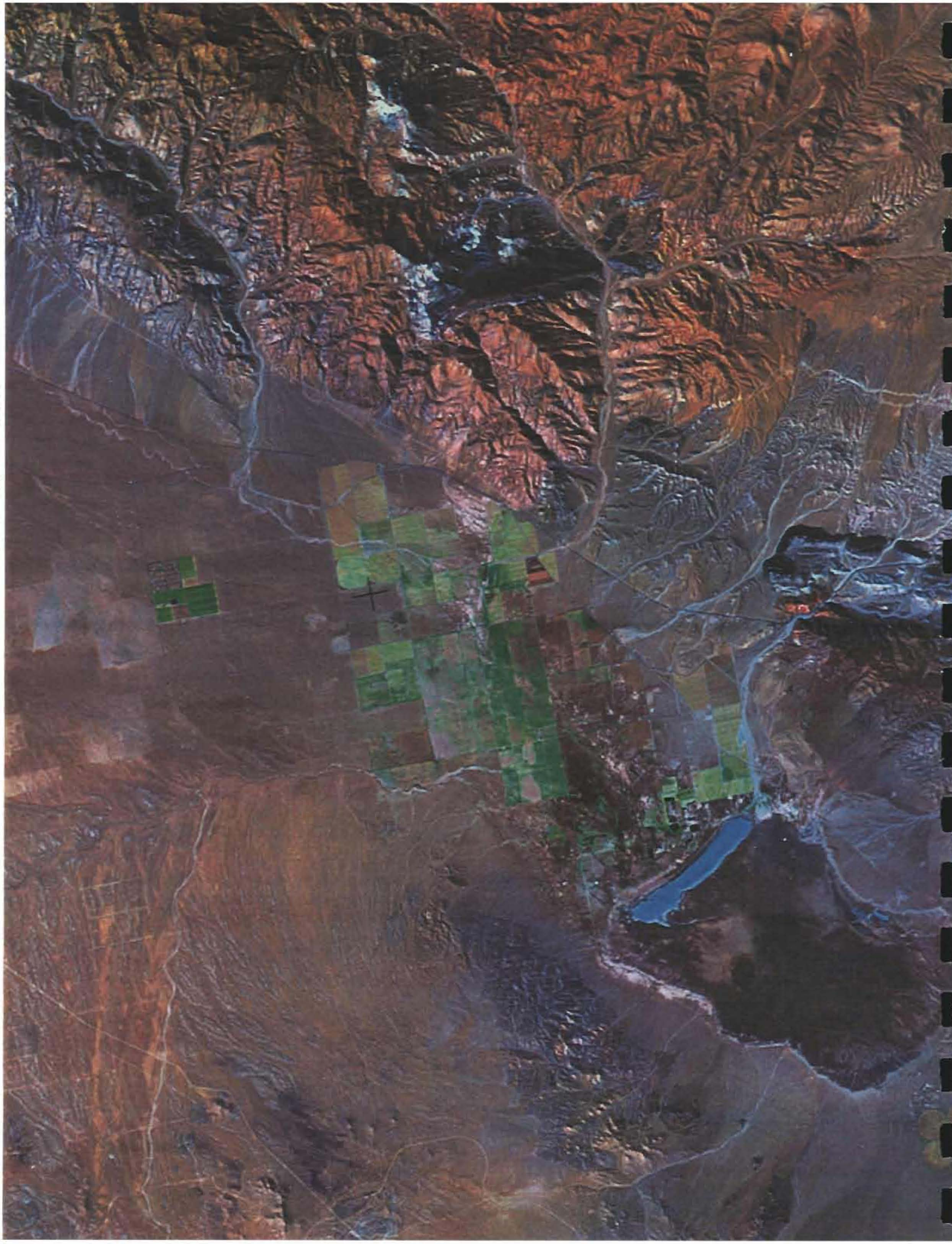
N

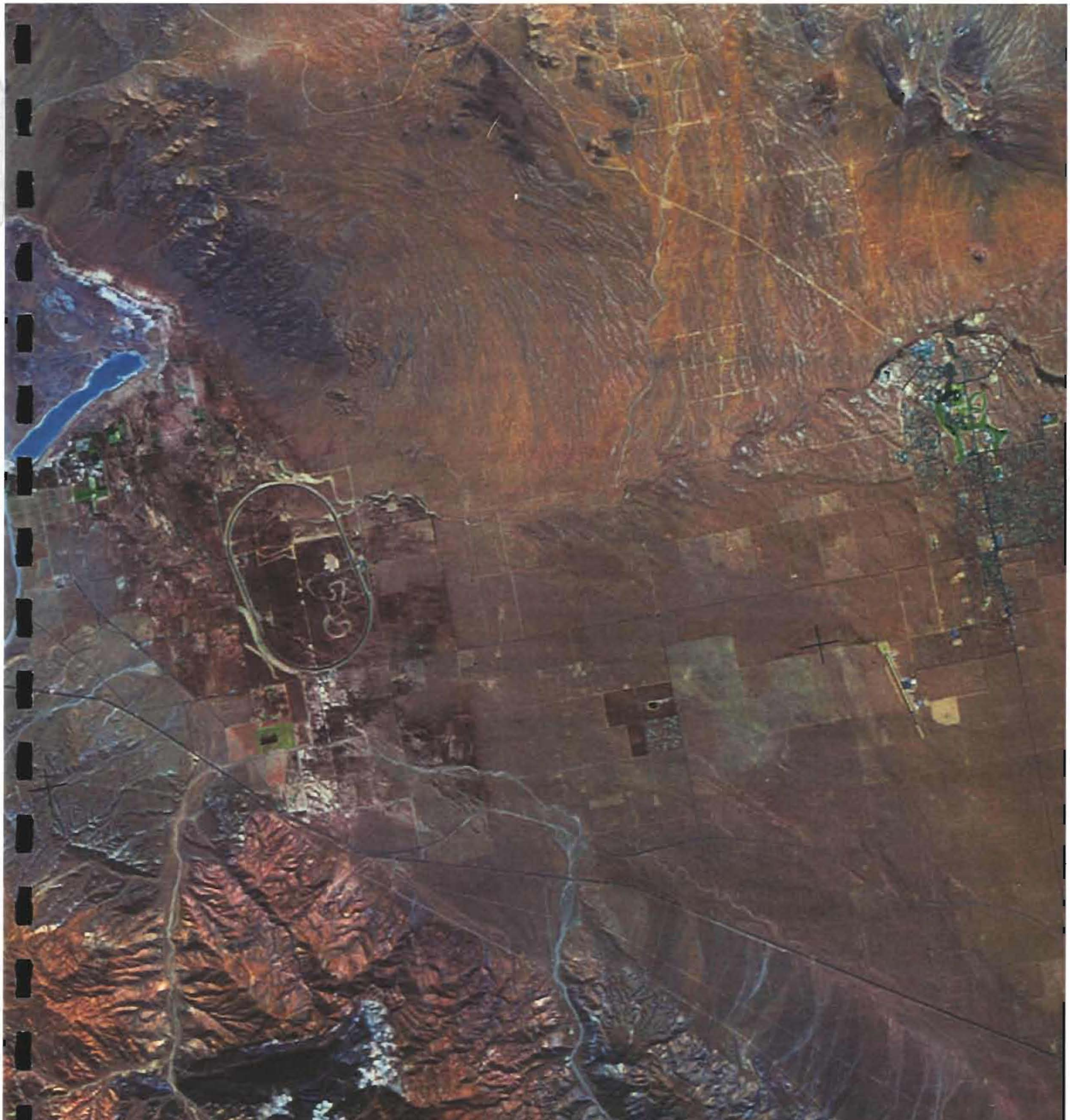
Figure F.3

Earth Satellite Corporation (EarthSat)
6011 Executive Blvd., Suite 400
Rockville, MD 20852

November 1997

APPENDIX G
LANDSAT TM IMAGERY





APPENDIX B

APPENDIX B

Environmental Checklist

1. **Project Title:** Fremont Valley Ranch Water Management

2. **Lead Agency Name and Address:** Los Angeles Department of Water and Power

3. **Contact Person and Phone Number:**

Peter Kavounas, Manager
Environmental and Legal Issues Group, Water Resources Section
Department of Water and Power, City of Los Angeles
111 N. Hope Street, Room 1469
Los Angeles, CA 90012-5701
(213) 367-1032

4. **Project Location:**

Kern County, 20 miles north of Mojave adjacent to State Highway 14 and the community of Cantil.

5. **Project Sponsor's Name and Address:** SAMDA, Inc.

6. **General Plan Designation:** N/A

7. **Zoning:** A-1, Agriculture

8. **Description of Project:** (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary.)

   The proposed project will extract groundwater from the Fremont Valley Ranch. This water will be conveyed to an existing aqueduct off site managed by the Los Angeles City Department of Water and Power. The purpose of the project is to supplement existing water supplies. Attachment 1 provides a detailed project description. The Initial Study addresses environmental issues and project design elements which will avoid impacts or minimize environmental impacts to non-significant levels.

9. **Surrounding Land Uses and Setting:** Briefly describe the project's surroundings.

Project location is surrounded by a mix of natural desert land and land in agricultural production. A State highway (14) , Southern Pacific railroad, Los Angeles Aqueduct 2, and LADWP transmission line cross the property near the western boundary.

10. **Other agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)**

Agency	*Permit/Approval*
CalTrans	Easement
Southern Pacific Railroad	Easement
Kern County Planning Department	Construction permits
U.S. Army Corps of Engineers	Authorization under NWP 12 and 14
California Department of Fish and Game	CESA Section 2081 Permit, CFGC 1603 agreement
U. S. Fish and Wildlife Service	Federal ESA Section 7 Permit
Lahontan RWQCB	Section 401 certification or waiver

APPENDIX B

Environmental Factors Potentially Affected:

The environmental factors checked below would be potentially affected by this project:

Land Use & Planning	Transportation/Circulation	Public Services
Population & Housing	√ Biological Resources	√ Utilities & Service Systems
Geological Problems	Energy & Mineral Resources	Aesthetics
√ Water	Hazards	√ Cultural Resources
√ Air Quality	√ Noise	Recreation

Evaluation of impacts to Affected Environmental Factors. (see following pages)

Mandatory Findings of Significance Determination. (To be completed by the Lead Agency)

On this basis of this initial evaluation, check ONE of the following:

I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared. ☐

I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because the mitigation measures described on an attached sheet have been added to the project. A NEGATIVE DECLARATION will be prepared. ☒

I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required. ☐

I find that the proposed project MAY have a significant effect(s) on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets, if the effect is a "potentially significant impact" or "potentially significant unless mitigated." An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed. ☐

I find that although the proposed project could have a significant effect on the environment, there WILL NOT be a significant effect in this case because all potentially significant effects (a) have been analyzed adequately in an earlier EIR pursuant to applicable standards and (b) have been avoided or mitigated pursuant to that earlier EIR, including revisions or mitigation measures that are imposed upon the proposed project. ☐

P. Kavounas   12/2/97

Signature   Date

PETER KAVOUNAS

Printed Name   For

Issues (and Supporting Information Sources):	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
I. LAND USE AND PLANNING. Would the proposal:				
a) Conflict with general plan designation or zoning? (source #(s): ( )	___	___	___	_X_
b) Conflict with applicable environmental plans or policies adopted by agencies with jurisdiction over the project? ( )	___	___	___	_X_
c) Be incompatible with existing land use in the vicinity? ( )	___	___	___	_X_
d) Affect agricultural resources or operations (e.g., impacts to soils or farmlands, or impacts from incompatible land uses)? ( )	___	___	___	_X_
e) Disrupt or divide the physical arrangement of an established community (including a low-income or minority community)? ( )	___	___	___	_X_

CLARIFICATION FOR RESPONSES

a. Project location is in an unincorporated area of Kern County. Project is compatible with the existing agricultural and natural open space designations of land in the vicinity of the site.

b. Project location is on private property. Project will conform to all applicable federal and state standards and regulations.

c. Project is compatible with the existing agricultural and natural open space uses of land in the vicinity of the site.

d. Agricultural uses of the land have been abandoned. 2.2 acres of natural open space will be permanently lost. This removal is not significant or incompatible with existing land uses.

e. No disruption to community planning aspects are anticipated and no local or regional socioeconomic impacts will result.

MITIGATION MEASURES

d. A groundwater monitoring program has been developed (described in Appendix A of the Initial Study) to ensure that no significant impacts to potential future land uses occur.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
II. POPULATION AND HOUSING. Would the proposal:				
a) Cumulatively exceed official regional or local population projections? ( )	___	___	___	_X_
b) Induce substantial growth in an area either directly or indirectly (e.g. through projects in an undeveloped area or extension of major infrastructure? ( )	___	___	___	_X_
c) Displace existing housing, especially affordable housing: ( )	___	___	___	_X_

CLARIFICATION FOR RESPONSES

a, b, c. No impacts to population and housing are anticipated, since no housing facilities or population increases will be associated with the project.

MITIGATION MEASURES

No mitigation required.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
III. GEOLOGIC PROBLEMS. Would the proposal result in or expose people to potential impacts involving:				
a) Fault rupture? ( )	___	___	___	_X_
b) Seismic ground shaking? ( )	___	___	___	_X_
c) Seismic ground failure, including liquefaction? ( )	___	___	___	_X_
d) Seismic, tsunami, or volcanic hazard? ( )	___	___	___	_X_
e) Landslides or mudflows? ( )	___	___	___	_X_
f) Erosion, changes in topography or unstable soil conditions from excavation, grading or fill? ( )	___	___	___	_X_
g) Subsidence of the land? ( )	___	___	_X_	___
h) Expansive soils? ( )	___	___	___	_X_
i) Unique geologic or physical features? ( )	___	___	___	_X_

CLARIFICATION FOR RESPONSES

a,b,c,d,e,f,h. While the Cantil fault traverses portions of the project site, and the Garlock fault is west of the Ranch property, the project will not result in exposure of people to geologic hazard or increase hazard over existing conditions. Earth shaking could result in damage to the pipeline. However, the design of the pipeline and pumping facilities will incorporate elements to prevent damage.

g. Groundwater extraction will be on a safe yield basis. Therefore,no land subsidence due to overdraft is anticipated. In addition, there are no clay layers (subject to subsidence) above 1400 feet MSL extending across the entire property and any potential for subsidence appears to be limited to the FVR itself.

i. The site does not contain any unique geologic or physical features.

MITIGATION MEASURES

a, b, g. Project design will incorporate pipeline joints that allow maximum flexibility and controls to detect abnormally low discharge pressure and automatically shutdown pumping. Local surveyors will take measurements every five-years during the life of the project to ensure that subsidence is detected and the pumping regime modified if necessary. If it is determined by independent analysts that Samda's pumping activities caused subsidence, mitigation efforts could include payment for the costs of the structures affected by subsidence.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
IV. WATER. Would the proposal result in:				
a) Changes in absorption rates, drainage patterns, or the rate and amount of surface runoff? ( )	____	____	____	_X_
b) Exposure of people or property to water related hazards such as flooding? ( )	____	____	____	_X_
c) Discharge into surface waters or other alteration of surface water quality (e.g. temperature, dissolved oxygen or turbidity)? ( )	____	____	____	_X_
d) Changes in the amount of surface water in any water body ? ( )	____	____	____	_X_
e) Changes in currents, or the course or direction of water movements? ( )	________	____	____	_X_
f) Change in the quantity of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations, or through substantial loss of ground water recharge capability? ( )	____	_X_	____	____
g) Altered direction or rate of flow of groundwater? ( )	____	____	_X_	____
h) Impacts to groundwater quality? ( )	____	____	_X_	____
i) Substantial reduction in the amount of groundwater otherwise available for public water supplies? ( )	____	____	____	_X_

CLARIFICATION FOR RESPONSES

f,g,h,. Groundwater extraction will be on a safe yield basis, the actual balance of extraction compared to supply has been studied. The results of the study are presented in Appendix A to the Initial Study. No recharge facilities on the former agricultural land are proposed and impacts to water quality are not expected to be significant.

MITIGATION MEASURES

Issues (and Supporting Information Sources):	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

Project design includes the implementation of a groundwater monitoring program to ensure that impacts to groundwater levels or quality will not occur. The program (described in detail in Appendix A to the Initial Study) will include the routine collection of water level data and samples from five of the non-pumping wells (#42, 46,48, & 51) on the FVR and the collection of data from wells on adjacent properties and local municipal users. These data will be combined to provide a comprehensive model to continuously monitor water levels and adjust pumping regimes, if necessary. If remedial action is required to mitigate the effects of a static water table decline, Samda shall contribute to the funding of the action. The amount of contribution will be directly proportional to the amount of water Samda has pumped from the FVR as compared to the total amount pumped from the southwestern Fremont Valley by all groundwater producers over the life of the project.

V. AIR QUALITY.

Would the proposal:

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Violate any air quality standard or contribute to an existing or projected air quality violation? ( )	___	___	_X_	___
b) Expose sensitive receptors to pollutants? ( )	___	___	_X_	___
c) Alter air movement, moisture, or temperature, or cause any change in climate? ( )	___	___	___	_X_
d) Create objectionable odors? ( )	___	___	___	_X_

CLARIFICATION FOR RESPONSES

a,b The project area is in attainment for PM10 and non-attainment for Ozone. Dust will be generated during the construction phase of the proposed project. It is anticipated that this dust will not exceed air quality standards, however the project will incorporate measures to ensure that dust levels remain below significant levels. Increased emissions will be temporary and not result in new violations of air quality standards.

MIIGATION MEASURERS

a, b. Project applicant will comply with standard construction practices for control of fugitive dust (Pm10) during construction.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
VI. TRANSPORTATION/CIRCULATION. Would the proposal result in:				
a) Increased vehicle trips or traffic congestion? ( )	___	___	___	_X_
b) Hazards to safety from design features (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)? ( )	___	___	___	_X_
c) Inadequate emergency access or access to nearby uses? ( )	___	___	___	_X_
d) Insufficient parking capacity on-site or off-site? ( )	___	___	___	_X_
e) Hazards or barriers for pedestrians or bicyclists? ( )	___	___	___	_X_
f) Conflicts with adopted policies supporting alternative transportation (e.g., bus turnouts, bicycle racks)? ( )	___	___	___	_X_
g) Rail, waterborne or air traffic impacts? ( )	___	___	___	_X_

CLARIFICATION FOR RESPONSES

Increased traffic related to vehicle trips by construction workers will be minimal. Construction scheduling will be coordinated with CalTrans, California Highway Patrol, and Southern Pacific Railroad and no impacts to transportation/circulation are anticipated.

MITIGATION MEASURES

No mitigation required.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
VII. BIOLOGICAL RESOURCES Would the proposal result in impacts to:				
a) Endangered, threatened, or rare species or their habitats (including but not limited to ;plants, fish, insects, animals, and birds)? ( )	___	_X_	___	___
b) Locally designated species (e.g., heritage trees)? ( )	___	___	___	_X_
c) Locally designated natural communities (e.g., oak forest, coastal habitat, etc.)? ( )	___	___	___	_X_
d) Wetland habitat (e.g., marsh, riparian, and vernal pool)? ( )	___	___	___	_X_
e) Wildlife dispersal or migration corridors? ( )	___	___	___	_X_

CLARIFICATION FOR RESPONSES

a. Biological surveys of the project site were conducted. There is some potential for desert tortoise (endangered) and Mohave ground squirrel (state listed as threatened) to be affected by the project. Sign of the desert tortoise and habitat for the Mohave ground squirrel are present on the site. Details of the surveys are presented in the Biological Assessment (Appendix C to the Initial Study)

MITIGATION MEASURES

a. Consultation with the California Department of Fish and Game and U.S. Fish and Wildlife Service has been initiated. Avoidance, worker education, revegetation, and provision of compensatory habitat is proposed to mitigate impacts to the desert tortoise and Mohave ground squirrel (See Appendix C to the Initial Study)

Issues (and Supporting Information Sources):	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
VIII. ENERGY AND MINERAL RESOURCES. Would the proposal:				
a) Conflict with adopted energy conservation plans? ( )	___	___	___	_X_
b) Use non-renewable resources in a wasteful and inefficient manner?	___	___	___	_X_
c) Result in the loss of availability of a known mineral resource that would be of future value to the region and the residents of the State?	___	___	___	_X_

CLARIFICATION FOR RESPONSES

a,b,c. No impacts to energy or mineral resources are anticipated because the project design incorporates the use of high efficiency electric motors, minimizing energy usage.

MIIGATION MEASURERS

No mitigation required.

IX. HAZARDS. Would the proposal involve:				
a) A risk of accidental explosion or release of hazardous substances (including, but not limited to: oil, pesticides, chemicals, or radiation)? ( )	___	___	___	_X_
b) Possible interference with an emergency response plan or emergency evacuation plan? ( )	___	___	___	_X_
c) The creation of any health hazard or potential health hazard? ( )	___	___	___	_X_
d) Exposure of people to existing sources of potential health hazards? ( )	___	___	___	_X_
e) Increased fire hazard in areas with flammable brush, grass, or trees? ( )	___	___	___	_X_

CLARIFICATION FOR RESPONSES

a,b,c,d,e. The project presents no additional health or safety hazards above baseline conditions.

MIIGATION MEASURES

No mitigation required.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

X. NOISE.

Would the proposal result in:

a) Increases in existing noise levels? ( )	____	____	____	__X_
b) Exposure of people to severe noise levels? ( )	____	____	____	__X__

CLARIFICATION FOR RESPONSES

a,b. There will be a temporary increase in noise during the construction phase; operation of water pumps as part of the project may result in long-term increases in ambient noise levels in the immediate vicinity of the pumps. However, because of the lack of sensitive receptors, the increased noise levels would not be not significant.

MITIGATION MEASURES

No mitigation required.

XI. PUBLIC SERVICES.

Would the proposal have an effect upon, or result in a need for new or altered government services in any of the following areas:

a) Fire protection? ( )	____	____	____	__X__
b) Police protection? ( )	____	____	____	__X__
c) Schools? ( )	____	____	____	__X__
d) Maintenance of public facilities, including roads? ( )	____	____	____	__X__
e) Other governmental services? ( )	____	____	____	__X__

CLARIFICATION FOR RESPONSES

a,b,c,d,e. The project will not require new public services affect existing services.

MITIGATION MEASURES

No mitigation required.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
XII. UTILITIES AND SERVICE SYSTEMS. Would the proposal result in a need for new systems or supplies, or substantial alterations to the following utilities:				
a) Power or natural gas? ( )	___	___	___	_X_
b) Communications systems? ( )	___	___	___	_X_
c) Local or regional water treatment or distribution facilities? ( )	___	___	___	___
d) Sewer or septic tanks? ( )	___	___	___	_X_
e) Storm water drainage? ( )	___	___	___	_X_
f) Solid waste disposal? ( )	___	___	___	_X_
g) Local or regional water supplies? ( )	___	___	_X_	___

CLARIFICATION FOR RESPONSES

g. No adverse impacts to local or regional water supplies are anticipated. However, project implementation includes a monitoring program to ensure that any impacts remain below a level of significance.

MITIGATION MEASURES

g. A groundwater monitoring program has been developed and is summarized in Section IV and described in detail in the Initial Study Appendix A.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
XIII. AESTHETICS. Would the proposal:				
a) Affect a scenic vista or scenic highway? ( )	___	___	___	_X_
b) Have a demonstrable negative aesthetic effect? ( )	___	___	___	_X_
c) Create light or glare? ( )	___	___	___	_X_

CLARIFICATION FOR RESPONSES

a,b,c. The project will not result in negative visual/aesthetic impacts to the Fremont Valley.

MITIGATION MEASURES

No mitigation required.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
XIV. CULTURAL RESOURCES. Would the proposal:				
a) Disturb paleontological resources? ( )	___	___	___	_X_
b) Disturb archaeological resources? ( )	___	___	_X_	___
c) Affect historical resources?	___	___	___	_X_
d) Have the potential to cause a physical change which would affect unique ethnic cultural values: ( )	___	___	___	_X_
e) Restrict existing religious or sacred uses within the potential impact area? ( )	___	___	___	_X_

CLARIFICATION FOR RESPONSES

a,b,c,d,e. A cultural resource study of the project site was conducted. An historic scatter and two historic resources, the LAA and the SPRR right of way were identified. No paleontological resources were identified or are likely to occur. Results of the surveys and mitigation measures are presented in Appendix D to the Initial Study.

MITIGATION MEASURES

The project has been designed to avoid impacts to the historic resources on the site. The historic scatter can be avoided entirely and the project impacts to the LAA and SPRR ROW do not compromise their integrity. No excavation/testing was performed so subsurface resources may not have been detected. However, based on the results of the survey, testing is not appropriate and a cultural resources monitor will be present during construction to ensure that no impacts to cultural resources occur.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
XV. RECREATION Would the proposal:				
a) Increase the demand for neighborhood or regional parks or other recreational facilities? ( )	___	___	___	_X_
b) Affect existing recreational opportunities? ( )	___	___	___	_X_

CLARIFICATION FOR RESPONSES

a,b. The project will have no effect on recreational facilities or opportunities in the area.

MITIGATION MEASURES

No mitigation required.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

XVI. MANDATORY FINDINGS OF SIGNIFICANCE

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	___	_X_	___	___
b) Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals?	___	___	___	_X_
c) Does the project have the impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	___	___	_X_	___
d) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	___	___	___	_X_

CLARIFICATION FOR RESPONSES

a. Impacts to water, and biological resources may occur as a result of the project. These impacts have been identified in technical studies and the Initial Study. All impacts can be mitigated to less than significant level and such mitigations have been incorporated into the project. Other projects in the area have been identified and could require additional groundwater withdrawal, potentially resulting in cumulative impacts. However, these impacts are not expected to be significant and a monitoring program and mitigation measures have been identified to ensure that these cumulative impacts remain below significant levels.

MITIGATION MEASURES

See Sections IV, VII, and the Initial Study and appendices.

APPENDIX C

APPENDIX C

BIOLOGICAL ASSESSMENT:
FREMONT VALLEY WATER MANAGEMENT PROJECT

22 October 1997

Prepared for:

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BIOLOGICAL ASSESSMENT:
FREMONT VALLEY WATER MANAGEMENT PROJECT

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BIOLOGICAL ASSESSMENT:
FREMONT VALLEY WATER MANAGEMENT PROJECT

Psomas and Associates
22 October 1997

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The proposed Fremont Valley Ranch (FVR) Water Management Project is located about 15 miles north of California City and 3 miles southeast of Cantil along State Highway 14. It is located at the western edge of Fremont Valley near the base of the eastern foothills of the Sierra Nevada Mountains in Kern County, California (Figure 1). The proposed project would supply water to the Los Angeles Department of Water and Power (LADWP) Los Angeles Aqueduct (LAA) where it will commingle with LAA water to provide a reliable dry year supply to Los Angeles.

The proposed project includes pumping groundwater and delivery of the groundwater to the Second LAA where it will supplement LADWP flows in dry years. Facilities include four wells, approximately 3.4 miles of well collection pipelines, a pump station with forebay, and a high pressure connection to the aqueduct. Facilities are sized in order to deliver from 8,000 to 12,000 acre-feet per year with an anticipated average yield of 10,000 acre-feet per year of groundwater to the aqueduct operating over a ten month period. Figure 1 shows a map of the project area and the location of the proposed facilities.

1.2 PROPOSED FACILITIES

Groundwater will be pumped at four existing wells as shown on Figure 1. The existing wells will be redeveloped and new well pumps installed. Each pump is sized in order to pump groundwater to a forebay located at the pump station near the aqueduct. Each well site will include a deep well turbine pump, an electrical control panel, and discharge piping. The refurbished facilities will be located in the same location as the previous facilities.

The groundwater collection piping system includes approximately 6,000 feet of 16" PVC pipe, 1,400 feet of 20" PVC pipe, and 10,500 feet of 24" PVC pipe. The proposed pipeline alignments are shown on Figure 1. A 15 foot wide access road will be constructed to the pump station on the west side of Highway 14 and is proposed to follow the alignment of the 24" pipeline from the frontage road. Pipe will be steel encased from right-of-way to right-of-way when crossing the Southern Pacific Railroad, and when crossing Highway 14.

Groundwater from each well site will be pumped through the collection piping system to a forebay located at the pump station site near the Second LAA. Prior to entering the forebay, a meter will be installed to measure flows. The forebay/booster pumping site is proposed to be located adjacent to the Second Los Angeles Aqueduct right-of-way. The forebay is proposed to be sized at 200,000 gallons, which gives approximately 25 minutes of storage at the design pumping rate. The forebay will essentially be a covered underground concrete storage tank. Flow will be delivered by suction piping to the adjacent booster pumping facility.

The aqueduct has a static pressure of approximately 440 psi. Flow from the forebay will be boosted to match the pressures in the Second Los Angeles Aqueduct and delivered through high pressure 24" CML&C steel pipe. A high pressure connection facility will transfer flow from the project facilities into the Second LAA. Four or five vertical turbine booster pumps will be used. Booster pump station controls will be installed to provide for remote operation of the pump station and monitor the operating status of the pump station equipment. The booster pump station site includes the forebay, a building to house the pumps, the metering station, and site piping. The site will be fenced, and will require an approximately 1000 foot square area near the aqueduct as shown on Figure 1.

1.3 CONSULTATION

This Biological Assessment has been prepared to address the potential impacts to federal- and state-listed endangered, threatened and candidate species resulting from the construction and operation of the project, and to recommend measures designed to mitigate and compensate for those potential impacts. This report contains the information needed by the USFWS to complete a Biological Opinion, in accordance with the requirements of Section 7 of the Endangered Species Act of 1973, as amended.

2.0 METHODOLOGY

2.1 GENERAL SURVEYS

Psomas and Associates conducted reconnaissance-level biological surveys along the entire alignment to characterize and document existing conditions and evaluate the potential of the habitat to support special status species. Wildlife surveys were conducted by Brian Leatherman concurrently with focused desert tortoise surveys as described in detail below. Scott White conducted the botanical survey on 20 October 1997. All plant and wildlife species encountered during the surveys were recorded on standardized data sheets. Vegetation community nomenclature follows Holland (1986) and series designations of Sawyer and Keeler-Wolf (1995). Plant nomenclature follows Hickman (1993). A complete list of the plant and wildlife species observed or detected during these surveys is presented in Appendix A.

Prior to the surveys, the most recent records of the California Natural Diversity Database (CNDDB 1997) and the California Native Plant Society's Electronic Inventory of Rare and Endangered Vascular Plants of California (CNPSEI 1997) were reviewed to identify the potential presence of federal or state listed threatened, endangered, candidate, or other special status species within the study area. The database records were searched by U.S. Geological Survey (USGS) 7.5' series topographic maps for the following quadrangles: California City; Cantil; Cinco; and Mojave NE.

2.2 DESERT TORTOISE SURVEYS

A focused survey in all suitable habitat following the most current recommendations for conducting desert tortoise surveys (USFWS 1992) were followed for the development of this report. These guidelines state that a 100-percent coverage survey be conducted over the entire project area using parallel belt transects 30 feet wide. Zone of influence surveys consisting of 30-foot-wide belt transects are to be conducted at 100, 300, 600, 1,200 and 2,400 feet from and parallel to the project boundary.

On 6 through 8 October 1997, 100-percent coverage and zone of influence surveys were conducted in suitable habitat within and adjacent to the project area. During the surveys, habitat conditions noted included vegetation type and density, substrate, topography, weather conditions, and amount of existing human-caused disturbance. All diagnostic sign of desert tortoise (e. g., live tortoises, carcasses, scat, burrows, tracks, eggshell fragments, pallets, drinking depressions, courtship rings) was recorded on standardized data sheets and mapped. A mirror was used to reflect sunlight into burrows to determine if tortoises were present. No tortoises were handled or marked. All wildlife encountered during the surveys were documented.

For 100-percent coverage of the project area, an area of approximately 60 feet, centered on the alignment, was surveyed using two parallel belt transects. The alignment was identified using a compass and various landmarks (transmission corridors, dirt roads, highways etc.) on the USGS 7.5' series quadrangle maps encompassing the project vicinity. Ten-foot poles of PVC pipe were flagged with streamers of bright pink surveyor's tape and placed at each end and corner of the alignment for reference points during the surveys.

East of Highway 14, desert tortoise habitat is only present to the north of the alignment. This habitat occurs for approximately one mile from the highway. Zone of influence surveys were conducted at 300, 600, 1,200, and 2,400 feet. No 100-percent coverage survey was conducted along this portion of the alignment because it follows a dirt road and is completely disturbed; the 100-foot zone of influence survey was omitted because the habitat was nearly completely disturbed.

West of Highway 14, all 100-percent coverage and zone of influence surveys were conducted. However, the western-most edge of the alignment, where it merges with the

	Mountains.		
LeConte's thrasher *Toxostoma lecontei*	Desert washes and flats with scattered shrubs and large open areas. Nests in cholla or other available thorny plants including saltbush; Mojave and Sonoran deserts	State CSC	Moderate (few suitable nest plants)
American badger *Taxidea taxus*	Inhabits mountains, deserts, interior valleys where burrowing animals provide a prey base and soils permit digging; throughout central and western N Amer	State CSC	Low (no burrows obs. during tortoise surveys)
Mohave ground squirrel *Spermophilus mohavensis*	Broad alluvial valleys with creosote or saltbush scrub and friable soils, W Mojave desert	State Threatened	Moderate (within range but habitat poor quality; soils west of Hwy. 14 too cobbly)
Alkali mariposa lily *Calochortus striatus*	Alkaline meadows and springs, creosote bush scrub; Mojave Desert	CNPS 1B	Absent (no suitable habitat)
Pygmy poppy *Canbya candida*	Desert shrublands; western Mojave desert, about 1000 to 4000 feet elevation	CNPS 1B	Moderate (suitable habitat, but scarcely seen)
Red rock poppy *Eschscholzia minutiflora* ssp. *twisselmannii*	Known only from the Rand and El paso Mts. on volcanic tuff in Mojave Desert scrub; W Mohave Desert	CNPS 1B	Absent (no volcanic soils)
Red rock tarplant *Hemizonia arida*	Mohave Desert scrub (clay soils); limited to vicinity of Red Rock Cyn in W Mojave Desert	State Rare CNPS 1B	Low (no suitable soils)
Charlotte's phacelia *Phacelia nashiana*	Loose sand and gravel on steep slopes of E Sierra Nevada, Pinyon Juniper/Joshua tree woodland; W Mojave Desert	CNPS 1B	Absent (no suitable mountain slopes)
Golden violet *Viola aurea*	Rocky or gravelly soils, about 3000-7500 ft. elev.; mountains at western margins of Mojave desert	CNPS 2	Low (below elevational range)

4.0 RESULTS

4.1 DESERT TORTOISE

The alignment on the east side of Highway 14 is located along a dirt road bordered by fallow agricultural land to the south, and a stand of disturbed creosote bush series to the north. A total of 2 corrected sign was observed on this side of the highway, including one old scat and one possible burrow. The scat was bleached and weathered, and the burrow was completely collapsed. It could not be determined if the burrow was that of a desert tortoise, coyote, or other desert animal.

The disturbed creosote bush scrub on the east side of Highway 14 is isolated on all sides from adjacent blocks of extensive habitat. The nearest patch of suitable desert tortoise habitat is located approximately one mile to the east. The western edge is bordered by Highway 14 (which has tortoise fencing along the entire length), and the northern, eastern, and southern edge is bordered by abandoned agricultural fields previously producing alfalfa. The level of human disturbance to this area is high.

There is no historical use of the area on the west side of Highway 14 for agriculture. Most of the habitat is relatively undisturbed although several dirt roads, OHV trails, dump sites, and camps were located. A summary of observed tortoise sign and its location is presented in Table 2. A total of 5 inactive burrows (of varying quality) and 3 possible burrows were observed. In addition, two carcasses were observed. No live tortoises were encountered along the alignment or zone of influence surveys. The location of corrected recent desert tortoise sign along the transects is shown in Figure 2.

Table 2. Summary of desert tortoise sign* observed by transect on Fremont Valley Ranch.

Transect No.	Burrows	Scat	Carcass
Alignment 1	1 deteriorated 2 possible tortoise, deteriorated	1	0
Alignment 2	1 possible tortoise, deteriorated	2	0
Subtotal	4	3	0
100' S	0	2	1
300'S	1 deteriorated	1	0
600' S	2 active (one with tracks, one with scat)	1	0
1,200' S	0	3	0
2,400' S	1 good burrow	0	0
100' N	0	1	0
300' N	0	3	1
600' N	0	0	0
1,200' N	0	0	0
2,400' N	0	0	0
Subtotal	4	11	2
300' E	0	0	0
600' E	0	0	0
1,200' E	1 possible tortoise, deteriorated	1	0
2,400' E	0	0	0
Subtotal	1	1	0
Total	**9**	**15**	**2**

* Numbers represent corrected sign.

4.2 MOHAVE GROUND SQUIRREL

The Mohave ground squirrel occurs in the western Mojave desert in portions Inyo, Kern, San Bernardino, and Los Angeles counties. It occupies one of the smallest geographic ranges of the 28 ground squirrels in North America (Hall 1981). The Mohave ground squirrel inhabits open areas in a variety of desert habitat including creosote bush scrub, alkali sink scrub and Joshua tree woodland. It has also been found in areas with previous ground disturbance. More specifically, Mohave ground squirrel seem to prefer large alluvial-filled valleys with deep, fine- to medium-textured soils vegetated with creosote bush scrub, shadscale scrub, or alkali sink scrub wherever desert pavement is absent (Aardahl and Roush 1985). Suppression of abundance appears to be related to the presence of desert pavement and eroded, shallow soils where runoff is rapid. The animals rarely inhabit mountainous or rocky terrain, or sterile playas, although exceptions are known (Zembal and Gall 1980).

In spite of what is known about the Mohave ground squirrel, determining what constitutes suitable or occupied habitat remains difficult. Mohave ground squirrel populations tend to be spatially redistributed over time. Because rainfall is not evenly distributed across the desert and varies from year to year, habitat conditions suitable for the squirrels do not remain geographically constant. The result of this random pattern is that populations in some areas may be declining while in others may be expanding. In addition, patterns of aestivation vary from year to year, with squirrels remaining active later in years of good rainfall. Based on these factors, all lands within the range of the squirrel should be considered Mohave ground squirrel habitat and impacts to such lands should require compensation (CDFG 1991). Records of Mohave ground squirrel exist for the project region (CNDDB 1997) and they are assumed to be present on or in the vicinity of the project area.

In an effort to consistently evaluate potential threats to the Mohave ground squirrel habitat within its range, the CDFG, Region IV, developed a Cumulative Human Impact Evaluation Format (CHIEF) to rank the quality of habitat. This system was intended to assist in standardizing mitigation requirements for loss or degradation of habitat, and not to determine presence or absence. Although the CHIEF guidelines are no longer used by the CDFG in determining compensible habitat and compensation ratios, it is useful to use some of the criteria outlined in that evaluation to describe the level of human-related disturbance to the site. This information, coupled with a discussion of the abiotic and other factors relative to the project site, and a detailed description of the habitat, is used to identify relative habitat quality and assign compensation ratios.

The project site on the east side of Highway 14 comprises fallow agricultural lands and no native habitat would be disturbed during construction. Although allscale series is re-invading portions of the fallow fields, succession has not proceeded to the point that a functional community exists. A cursory investigation of this area did not reveal any rodent burrows or other signs of wildlife except at the borders where adjacent areas support creosote bush scrub. In addition to the historic use of the area for agriculture, a number of other human associated impacts occur on the site. Telephone poles and associated maintenance roads, Southern Pacific railroad right-of-way and associated road, debris associated with the maintenance of farm equipment, and several dumps are located in the area.

Although the habitat on the west side of highway 14 is relatively intact, there are several reasons that it may not be considered an area critical to the conservation of the Mohave ground squirrel. These reasons are listed below

1. Mohave ground squirrels prefer large alluvial-filled valleys with deep, fine- to medium-textured soils. Suppression of abundance appears to be related to the presence of desert pavement and eroded, shallow soils where runoff is rapid. The animals rarely inhabit mountainous or rocky terrain. While the majority of Fremont Valley can be characterized as suitable habitat, habitat at the base of the Sierra Nevada foothills is only marginally suitable. Soils are relatively coarse gravels and the cobble component increases as the alignment approaches the mountains. In addition, the latter portion of the alignment is located on an active alluvial slope at the mouth of a canyon where periodic flooding is apparent.

2. This portion of the alignment is bordered by the Sierra Nevada on the west and north and by Highway 14 on the east. Tortoise fencing is present along this entire portion of Highway 14, and there is no habitat on the other side of the highway. The project is located at the extreme western edge of Mohave ground squirrel range. These factors greatly decrease the relative contribution of the site to squirrel conservation because it is likely isolated from any core population.

3. There is human-related disturbance to the site including dirt roads, grazing, OHV trails, camps, transmission lines and associated roads, two aqueduct right-of-ways and associated roads, and nearby residents.

5.0 POTENTIAL IMPACTS

In general, the project has been designed to avoid and minimize potential impacts to sensitive biological resources. This was achieved primarily by routing the pipeline alignment through previously disturbed habitat or (essentially) non-habitat to the extent practicable, and by making use of existing facilities. The only federally listed plant or wildlife species that could be affected by the project is the threatened desert tortoise. No other federally listed or candidate plant or animal species are known to inhabit areas that could be affected by the project. The only state listed plant or wildlife species that could be affected by the project is the threatened Mohave ground squirrel.

5.1 CONSTRUCTION IMPACTS

For the purposes of habitat compensation and mitigation, temporary and permanent impacts to wildlife habitat will be considered. Temporary impacts are considered long-term disturbances because of the relatively long recovery time of desert habitats. Potential impacts would only occur west of Highway 14 where creosote bush scrub occurs. Desert tortoise and Mohave ground squirrel habitat does not occur east of Highway 14 because agricultural practices have removed suitable habitat along the alignment. Temporary disturbance due to construction activities would be restricted to a zone of approximately 20 feet in width.

Temporary disturbance would occur to approximately 1.0 acre of suitable desert tortoise habitat along the alignment due to pipeline construction. No disturbance in addition to that associated with construction along the alignment are anticipated. Spoil/stockpile areas and extra staging areas for road and railroad crossing will be located in previously disturbed areas. Permanent disturbance would be associated with the dirt road along the alignment on the west side of Highway 14, which would also likely be used to access the booster pumping facility. The booster pumping station site includes the buried forebay, a building to house the pumps, the metering station, and site piping.. Although native vegetation is likely to eventually re-invade, the loss of habitat is considered permanent because the site will be fenced (removing potential use by desert tortoise). Permanent habitat loss associated with the road along the alignment and the fenced area is approximately 1.2 acres.

The desert tortoise could be affected by construction activities, including initial grading, excavation, removal, and crushing of habitat; increased vehicular traffic (construction and off-road vehicles); and increased human presence in the area. Specific impacts by construction potentially include loss or displacement of individuals, disturbance to burrows, and removal and/or disturbance to vegetation comprising tortoise habitat. Individuals could be lost by being crushed by construction vehicles or equipment, either on access roads or within burrows, collection by humans, illegal shooting and vandalism, becoming trapped in the pipeline trench, and indirect impacts. Implementation of appropriate mitigation measures will minimize impacts to this species.

5.2 OPERATION AND MAINTENANCE

The amount of disturbance due to operation and maintenance of the pipeline and associated facilities would be minimal, consisting of nonroutine, infrequent on-site inspections or maintenance activities of the buried pipeline. Pipeline maintenance could potentially affect desert tortoise during periodic access to the project area for routine inspection, repairs, and other activities. Individual tortoises could potentially be lost during these activities due to collision with equipment or vehicles. Tortoise burrows could potentially be disturbed during maintenance activities.

6.0 MITIGATION

6.1 DESERT TORTOISE

A. A desert tortoise training program shall be developed and presented to all construction personnel and operations and maintenance crews. The program will consist of briefing sessions and pamphlets, both of which will be developed by biologists familiar with the requirements of the desert tortoise.

The training program shall include:

- The legal and sensitive status of the tortoise, including the reasons for tortoise decline;
- A review of desert tortoise natural history and habitat requirements;
- A description of the adopted mitigation measures designed to minimize impacts and the commitment of the project proponent to comply with those measures;
- An explanation of the consequences for failure to comply with mitigation measures and other laws for individuals and the project;
- Protocol to follow if a tortoise is encountered;
- All individuals that work on the project shall be required to attend this training and sign a form acknowledging that the training was received and understood.

B. Firearms, pets and camping shall be prohibited at the construction site. All trash shall be placed in coyote and raven-proof containers and removed from the site on a daily basis. Sanitary facilities shall be provided for the work crew.

C. A preconstruction survey for desert tortoise shall be conducted the day before construction is scheduled for a particular area. Burrows that cannot be avoided by construction shall be excavated using hand tools by a qualified biologist permitted to perform such work. All burrows within the construction zone shall be collapsed to prevent re-entry. Burrow excavation and tortoise handling shall follow the Guidelines for Handling Desert Tortoises During Construction Projects [(Desert Tortoise Council 1994 (Revised 1996)].

Tortoises excavated from unavoidable burrows along the alignment shall be relocated to unoccupied natural or artificially constructed burrows immediately following excavation. The new burrow shall be constructed about 300 feet from the original and be similar in size, shape, and orientation.

D. All tortoises that are moved shall be marked using techniques described in the Desert Tortoise Council (1994). Biologists handling tortoises shall be included in permits issued by the USFWS. Disposable surgical gloves shall be worn when handling tortoises to minimize spread of Upper Respiratory Tract Disease (URTD). Only one tortoise shall be handled with each pair of gloves. All other equipment used to process tortoises shall be sterilized.

E. Disturbed areas shall be revegetated with native species to accelerate recovery of the habitat.

F. A qualified tortoise biologist/compliance monitor shall be present during construction to remove tortoises from the construction zone. This monitor shall also be able to give tortoise training to sub-contractors and new personnel.

G. Length and duration of the open trench shall be kept to the minimum extent feasible. The trenches shall be inspected daily by the tortoise biologist and immediately before backfilling. Any animals shall be released in the general locality beyond the area of disturbance.

H. Vehicle operation by the construction and operations and maintenance crews shall be prohibited off the right-of-way.

I. Speed of vehicles along the ROW and access roads shall be limited to 15 mph.

6.2 MOHAVE GROUND SQUIRREL

A. Provide compensatory habitat for disturbance of Mohave ground squirrel habitat. The acres of habitat to be compensated would depend on the actual amount of surface disturbance resulting from the proposed project and the pre-existing habitat quality.

B. Compensation would be at a ratio of 1:1 or 2:1 based on pre-project habitat quality as described in Section 4.2. Habitat east of Highway 14 would be compensated at 1:1 (one acre of compensation land for each acre disturbed). Habitat west of Highway 14 would be compensated at 2:1.

6.3 CONCLUSIONS

Implementation of the project as proposed could affect the federally-listed desert tortoise and the state listed Mohave ground squirrel through construction activities and operation. The implementation of the protection measures identified in this assessment would minimize construction impacts to a level that would not significantly affect these species or their habitat. Incidental take of desert tortoise during operation of the facilities is considered to be remote, and the loss of a significant number of tortoises is not expected to occur.

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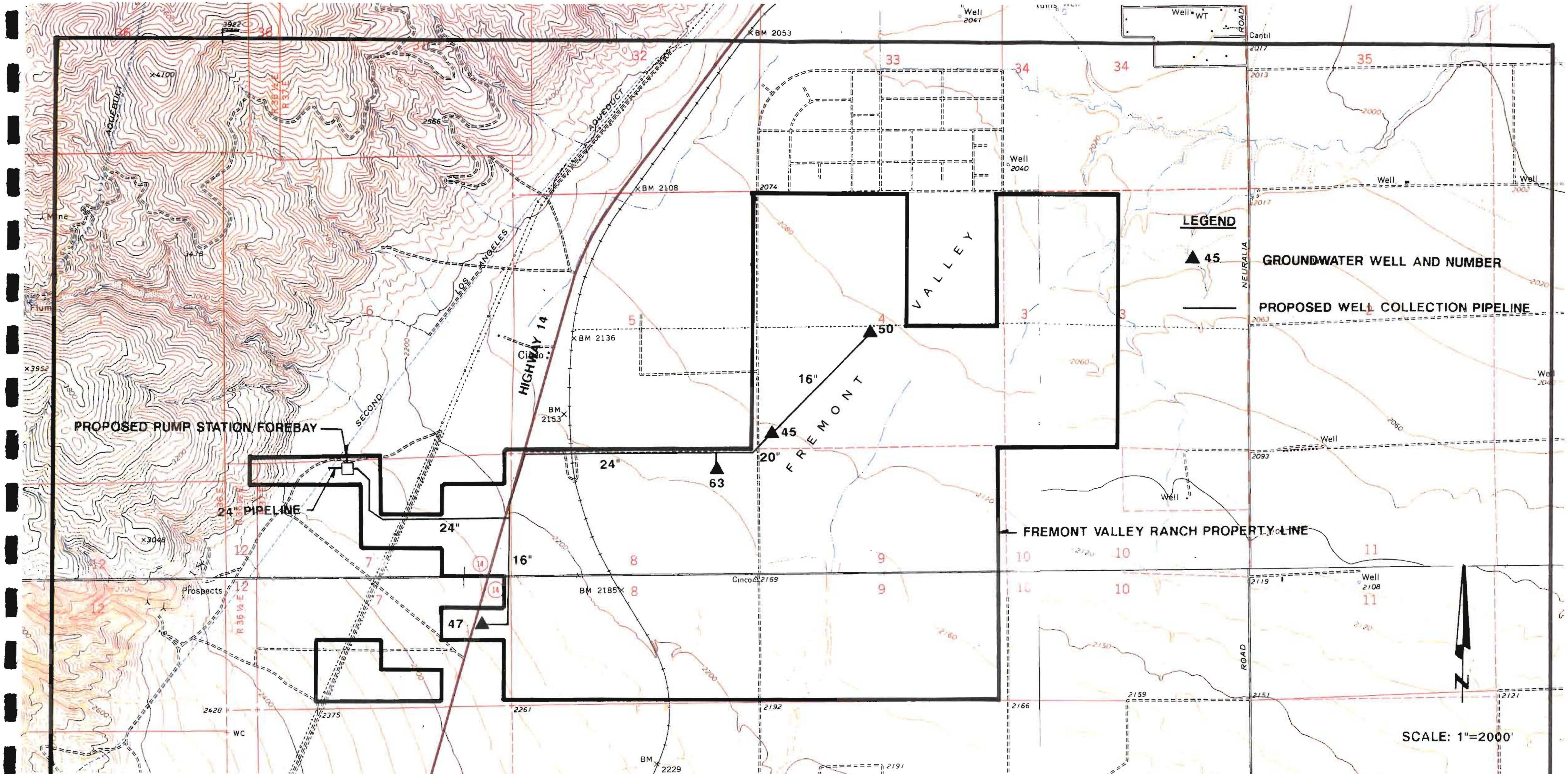

FREMONT VALLEY RANCH WATER MANAGEMENT PROJECT
CONCEPTUAL FACILITIES LAYOUT

CLIENT: SAMDA WATER EXPLORATION

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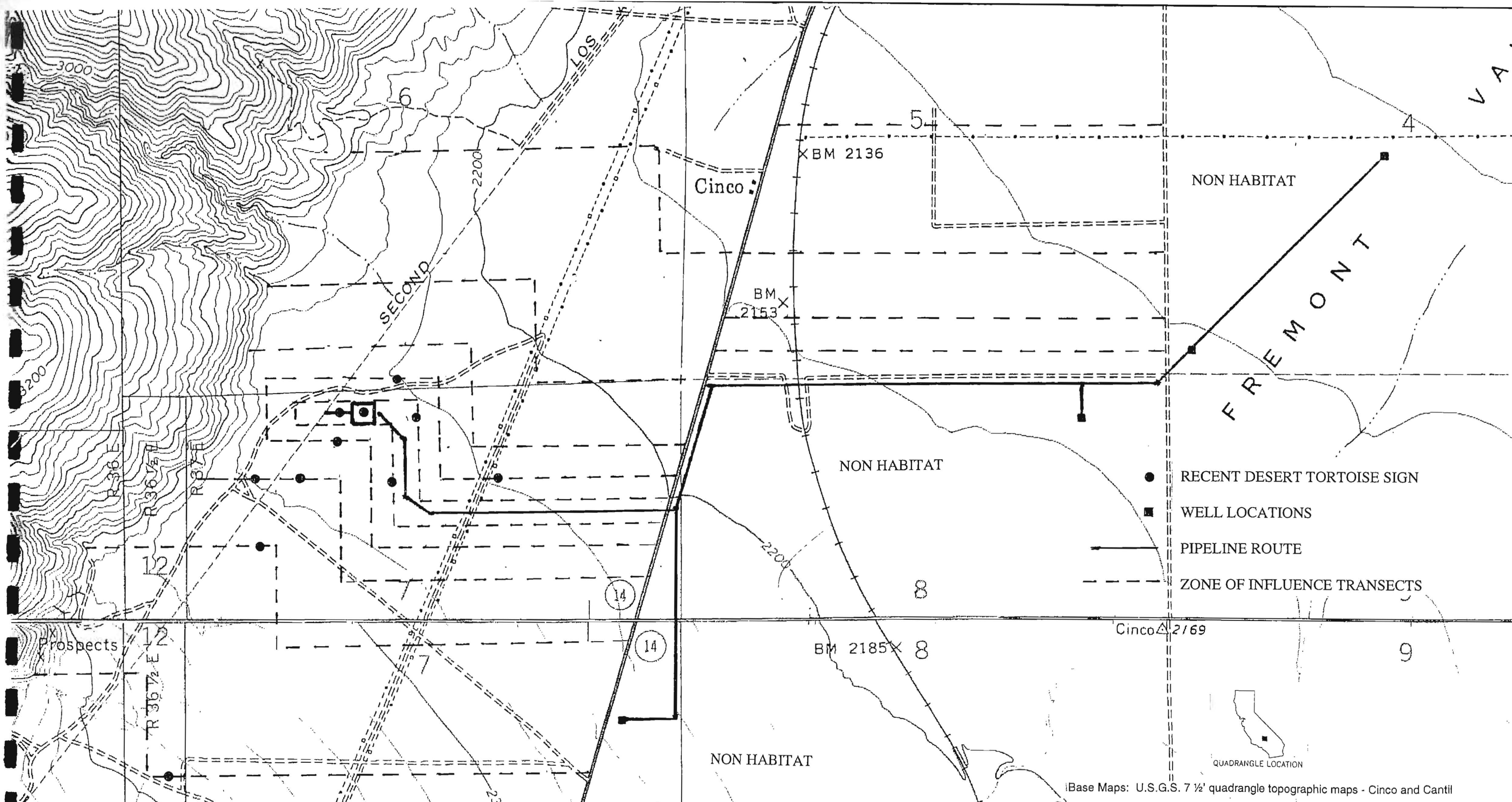
FIGURE 1



FREMONT VALLEY RANCH WATER MANAGEMENT PROJECT
CONCEPTUAL FACILITIES LAYOUT

CLIENT: SAMDA WATER EXPLORATION

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FIGURE 2

APPENDIX A

Table 1. Plant species observed at Fremont Valley Ranch.

SCIENTIFIC NAME	COMMON NAME
Amaranthaceae	Amaranth Family
Amaranthus sp.	Unid.annual amaranth
Asteraceae	Sunflower Family
Ambrosia acanthicarpa	Annual bursage
Ambrosia dumosa	White bursage
Chryosothamnus paniculatus	Rabbitbrush
Encelia actoni	Acton encelia
Encelia farinosa	Brittlebush
Hymenoclea salsola	Cheesebush
Lepidospartum squamatum	Scalebroom
Stephanomeria pauciflora	Few-flowered stephanomeria
Brassicaceae	Mustard Family
Stanleya pinnata (?)	Prince's plume
Boraginaceae	Borage Family
Amsinckia tesselata	Fiddleneck
Cactaceae	Cactus Family
Opuntia echinocarpa	Silver cholla
Capparaceae	Caper Family
Isomeris arborea	Bladderpod
Chenopodiaceae	Goosefoot Family
Atriplex polycarpa	Four-wing saltbush
Atriplex sp.	Unidentified saltbush
Salsola tragus	Russian thistle
Ephedraceae	Ephedra Family
Ephedra nevadensis (?)	Desert tea
Fabaceae	Pea Family
Senna armata	Desert senna
Dalea sp.	Indigo bush
Geraniaceae	Geranium Family
Erodium cicutarium	Red-stemmed filaree
Lamiaceae	Mint Family
Salazaria mexicana	Paper-bag bush
Loasaceae	Stick-leaf Family
Menzelia sp.	Blazing star
Petalonyx thurberi	Sandpaper plant
Malvaceae	Mallow Family
Spharalcea ambigua (?)	Desert mallow
Nyctaginaceae	Four-O'clock Family

Mirabilis sp.	Wishbone bush
Plantaginaceae	Plantain Family
Plantago insularis (?)	Annual plantago
Poaceae	Grass Family
Achnatherum hymenoides	Indian ricegrass
Bromus rubens	Red brome grass
Hilaria rigida	Galleta grass
Schismus barbatus (?)	Schismus grass
Polygonaceae	Buckwheat Family
Eriogonum spp.	Unid. annual buckwheat (2 species)
Solanaceae	Nightshade Family
Datura wrightii	Jimsonweed
Lycium andersonii	Wolfberry
Lycium sp.	Unid. Wolfberry
Zygophyllaceae	Caltrop Family
Larrea tridentata	Creosote bush
Tribulus terestris	Puncture vine

Table 2. Wildlife species observed at Fremont Valley Ranch.

SCIENTIFIC NAME	COMMON NAME
REPTILIA	Reptiles
Testudinidae	Land Tortoises
Gopherus agassizii*	Desert tortoise
Iguanidae	Iguanids
Uta stansburiana	Side-blotched lizaard
Teiidae	Whiptails
Cnemidophorus tigris	Western whiptail
AVES	Birds
Accipitridae	Raptors
Circus cyaneus	Northern harrier
Buteo jamaicensis	Red-tailed hawk
Caprimulgidae	Nightjars
Phelaenoptilus nuttallii	Common poorwill
Corvidae	Jays and crows
Corvus corax	Common raven
Troglodytidae	Wrens
Salpinctes obsoletus	Rock wren
Embizeridae	Warblers/sparrows/black-birds/orioles
Amphispiza belli	Sage sparrow
Zonotrichia leucophrys	White-crowned sparrow
Sturnella neglecta	Western meadowlark

Fringillidae	Finches
Carpodacus mexicanus	House Finch
MAMMALIA	Mammals
Heteromyidae	Kangaroo rats/pocket mice
Dipodomys sp.	Kangaroo rats
Leporidae	Hares and rabbits
Lepus californicus	Black-tailed jackrabbit
Canidae	Dogs/wolves/foxes
Vulpes macrotis*	Kit fox
Canis latrans*	Coyote

* Detected by sign only; not observed.

APPENDIX D

APPENDIX D

AN ARCHAEOLOGICAL SURVEY OF THE FREMONT VALLEY PIPELINE PROJECT

MOJAVE, CALIFORNIA

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October 13, 1997

MANAGEMENT SUMMARY/ABSTRACT

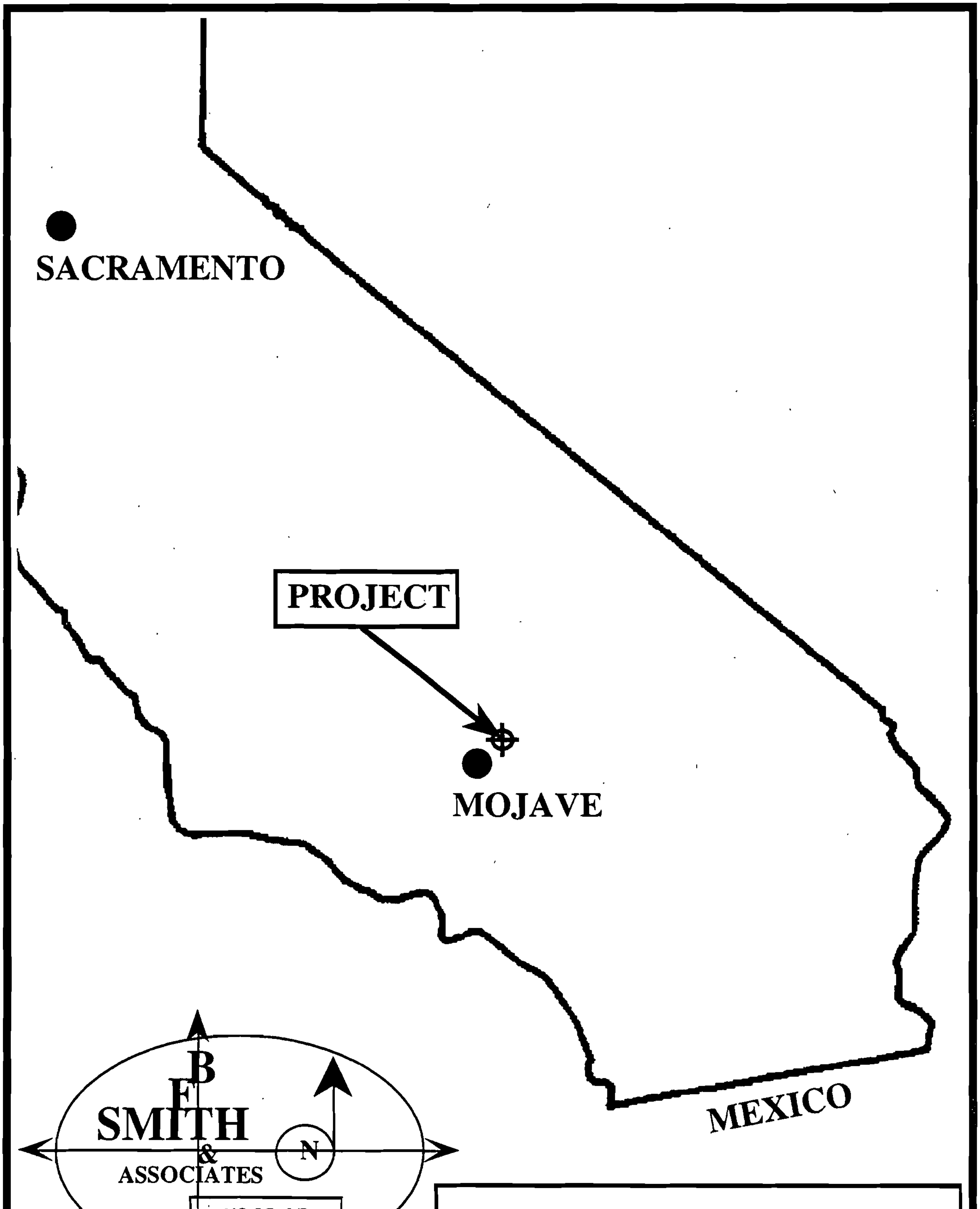
The following letter report describes an archaeological and paleontological survey and institutional records search conducted by Brian F. Smith and Associates (BFSA) for the Fremont Valley Pipeline Project, located on the Fremont Valley Ranch, north of the town of Mojave in Kern County, California (Figure 1). This study was conducted in compliance with the California Environmental Quality Act (CEQA) and the environmental policies of the County of Kern. The pipeline survey was conducted by archaeologists Shelly Raven-Jennings, Ph.D., and Jim Clifford (M.A.) and paleontologist George Kennedy, Ph.D. on October 6, 1997. Institutional record searches were conducted by the Southern San Joaquin Valley Archaeological Information Center (Confidential Appendix). One cultural resource was identified on the project as a result of the field survey. The record searches also identified two linear sites within the project areas (the Southern Pacific Railroad and the Los Angeles Aqueduct), which were relocated during the current survey. Fifteen archaeological sites are recorded within a one-mile radius of the project area. The project will not adversely impact any significant resources, and no further study of cultural resources is recommended for this project. No paleontological resources were identified during the survey, and based upon the geological setting of the project, the potential is very remote for encountering fossils within the pipeline trenches.

All notes and other material related to this project will be curated at the archaeological laboratory of BFSA in Poway, California.

INTRODUCTION

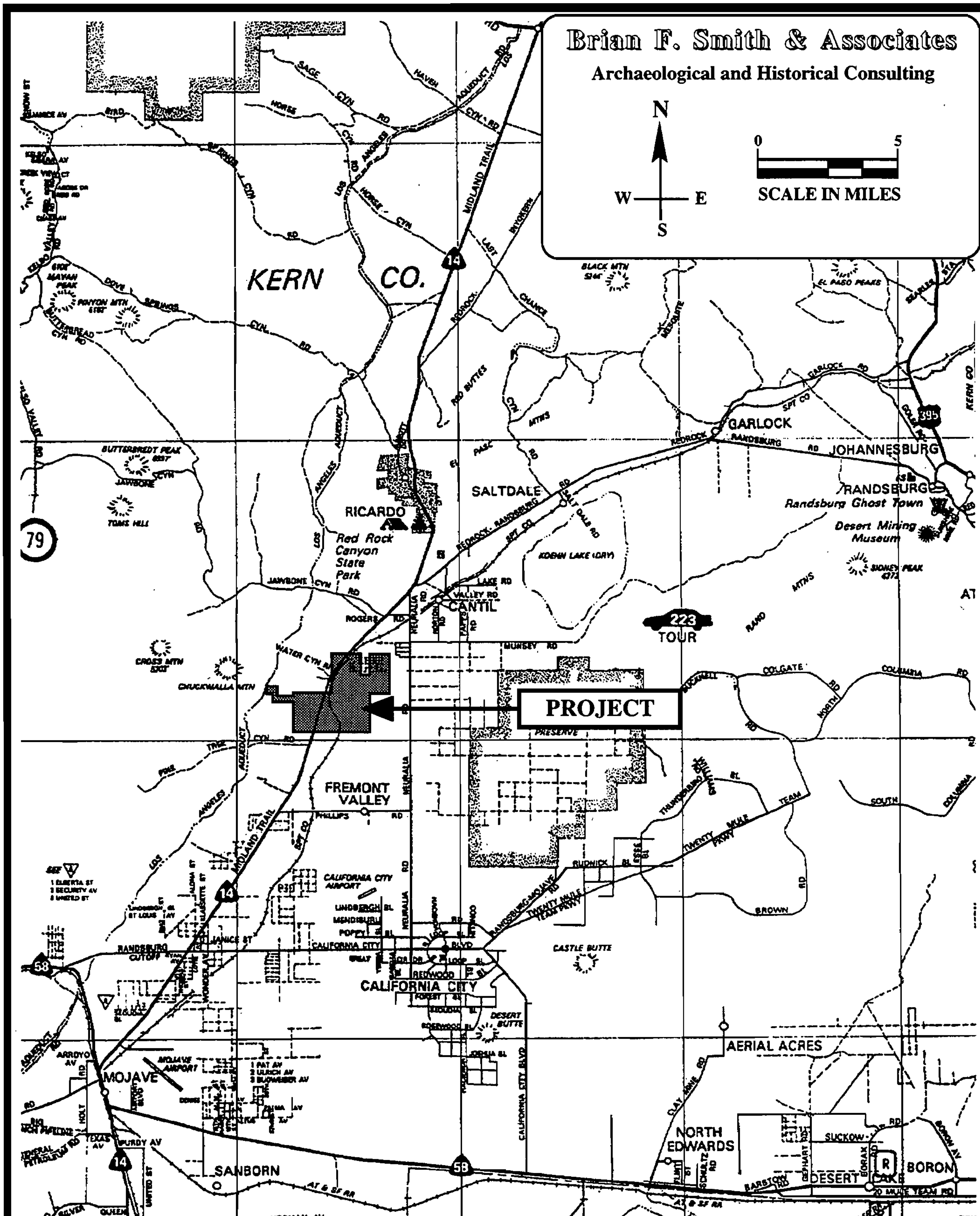
The Fremont Valley Pipeline Project is located within the 2,312-acre Fremont Valley Ranch, which lies adjacent to State Highway 14 approximately 20 miles northeast of the town of Mojave and one mile from the eastern base of the Sierra Nevada Mountains in Kern County, California (Figure 2). The proposed 3.5 linear mile pipeline development is located in Township 11 North, Range 1 East, USGS *Cinco*, *Mojave NE*, *Cantil*, and *California City North* Quadrangles. The concept of this project is to draw water from four wells on site and pump the water into the Los Angeles Aqueduct to augment the city's water supply.

The proposed project consists of the installation of pumps on four of the 13 existing wells and the construction of a 5,200-foot, 24-inch diameter main pipeline and a 5,000-foot, 10-inch diameter manifold buried pipeline. Also planned is a ten-acre-foot storage reservoir which is proposed to be excavated west of the Southern Pacific Railroad. The conveyance pipelines connecting the production wells to the storage reservoir are to be buried alongside abandoned alfalfa fields, while the high pressure pipeline, which would tie the storage reservoir to the Los Angeles Aqueduct, is to be buried across desert land west of Highway 14. All development activities will be on Fremont Valley Ranch property with the exception of the main pipeline which



GENERAL LOCATION MAP
THE FREMONT VALLEY PIPELINE PROJECT

FIGURE 1



PROJECT LOCATION MAP

THE FREMONT VALLEY PIPELINE PROJECT

THOMAS BROTHERS MAPS

FIGURE 2

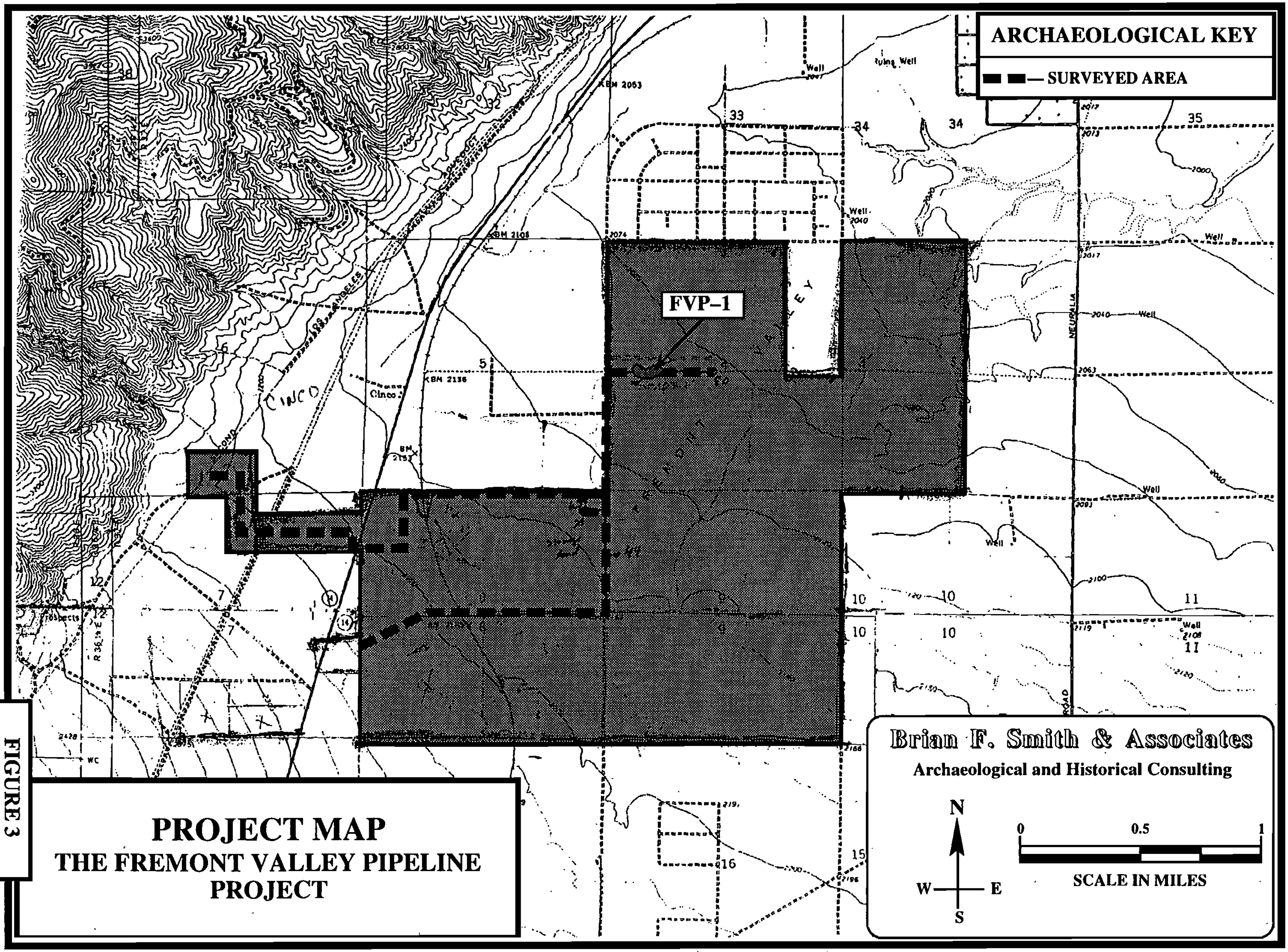


FIGURE 3

PROJECT MAP
THE FREMONT VALLEY PIPELINE PROJECT

needs to be bored under Highway 14 and the Southern Pacific Railroad. The configuration of the proposed pipeline alignment is illustrated on the Project Map (Figure 3).

Most, if not all, of the property, and much of the surrounding area, has been previously disturbed by agricultural activities. In 1974, the majority of the property (2,166 of 2,312 acres) was converted from native xeric communities to alfalfa fields, which were subsequently abandoned in 1985. Likewise, most of Fremont Valley is deserted agricultural land with abandoned farming operations lying to the north and east of the project area, and desert land encompassing the south and west. To the northeast of the project, Honda Motors purchased 7,000 acres in 1991 for a testing facility. Also surrounding the project are several tracts of land under the jurisdiction of the Bureau of Land Management, some of which is designated Desert Tortoise habitat.

ENVIRONMENTAL SETTING

The project area lies at the western edge of Fremont Valley approximately 20 miles northeast of the town of Mojave and 15 miles north of California City between 2,100 feet and 2,300 feet above mean sea level. The valley is bounded on the north by the El Paso Mountains, on the east by the Rand Mountains, on the west by the Sierra Nevada, and on the south by an alluvial open valley, with much of the upper valley soil being comprised of Quaternary alluvium and colluvium. The project area is relatively flat with a number of shallow dry washes running west to east as a result of runoff from the Sierra Nevada Mountains. The area is only sparsely vegetated because previous farming and ranching activities had cleared most of the native vegetation.

METHODOLOGY

The archaeological/paleontological survey for the Fremont Valley Pipeline Project consisted of an intensive field reconnaissance of the entire linear project. The Area of Potential Effect (APE) for this project was considered to be an area including 100 feet on each side of the proposed centerline of the pipeline alignment. Approximately 18 person-hours were expended in the field survey. The study of the Fremont Valley Pipeline Project conformed to the Kern County Guidelines for CEQA compliance. No artifacts were collected during the survey, nor were any excavations conducted.

Field Methodology

The archaeological reconnaissance of the pipeline alignment took place on October 6, 1997. The field survey was conducted by walking parallel transects spaced ten meters apart on either side of the alignment. For the central and eastern portions of the project, the proposed project will use existing roadways. Transects were positioned on either side of the roadways. In the southwestern portion, the segment approaching Well Number 47 from the east crossed a tilled field, and the transect lines were flagged. On the far western portion of the project, transects were centered upon PVC pipes laid out by PSOMAS biologist, Brian Leatherman. The surveyed alignment is illustrated in Figure 3. Visibility of the ground surface was adequate on all portions of the parcel.

REPORT OF FINDINGS

Archaeological Survey Results

The archaeological reconnaissance resulted in the recording of a single previously undiscovered historic site, FVP-1. This small scatter of historic and recent debris was located in the northeastern portion of the project near Well 50. The site measures 60 feet (18 meters) east to west by 40 feet (12 meters) north to south. The site contained more than twenty pieces of purple (solarized) glass, approximately 20 pieces of aqua glass, and 15+ pieces of brown glass. Ten pieces of porcelain (no pattern) were also noted. Over 30 pieces of unidentifiable metal, some of which appeared to be recent additions, were also present, as were other recently discarded items such as approximately 15 round nails and one glove. The site was located along a faint track beneath power lines servicing Well 50; a more traveled road paralleled the power lines less than 30 feet to the north. The site location is illustrated in Figure 3.

Both the Los Angeles Aqueduct and the Southern Pacific Rail Line, which were previously recorded as historic sites, were encountered during the survey, and are also illustrated on Figure 3.

Paleontological Survey Results

The project site was also investigated for potential paleontological (fossil) resources. A ground survey on either side of the proposed pipeline right-of-way did not reveal any fossils or sedimentary exposures that might yield any fossils. A few scattered mammal bones found on the surface were all modern. Geologically, the site is located on alluvium and colluvial materials derived from the adjacent hills to the west, on the upthrown side of the Garlock Fault. The rocks along the fault are predominantly "granitic" (quartz monzonite) plutonic rocks (see geologic map of Dibblee, 1967: Plate 1, west half), which are never fossiliferous. The outwash material represents Holocene (modern) and Pleistocene sands and gravels washed down steep canyons and redeposited on alluvial fans and outwash surfaces. The project site lies in a down-dropped graben (basin) between two fault strands within the Garlock Fault Zone (Clark 1973 [1974]: Sheet 2, Section D). No fossiliferous formations are exposed in the adjacent hills to the northwest, and no bedrock exposures are present in the project site. An eroded fault scarp (Clark 1973 [1974]: Sheet 2, Section D) is located near the midpoint of the dividing line between Sections 8 and 9, but no bedrock exposures are present. Limited areal exposures of the Pliocene Ricardo Formation are present approximately one mile to the north of the project site, but drainage patterns from there are to the east, away from the project site. The Ricardo Formation has yielded vertebrate fossil remains in other areas.

Given the alluvial/colluvial nature of the exposed sediments within the project site, their probable occurrence to some depth in the fault graben, and the distance from any potentially fossiliferous formations, it is highly unlikely that any fossils would be found in these sediments. The project area is thus regarded as lacking any potential paleontological resources.

Results of the Record Searches

Archaeological record searches for the Fremont Valley Pipeline Project were performed by the Southern San Joaquin Valley Archaeological Information Center (Confidential Appendix). Two cultural resources have been registered for the Fremont Valley Pipeline Project area, both historic sites. The first is the Southern Pacific Railroad Grade (CA-KER-3366-H and CA-INY-4607-H), which runs through the center of the project. This segment of the Southern Pacific line runs from Mojave Station to Searles Junction, and was constructed in 1908. The second site, CA-KER-3549-H, is the Second Los Angeles Aqueduct, which lies at the extreme western edge of the project. The first phase was built between 1908 and 1913, with a second phase begun in 1967.

A total of 15 sites have been recorded within one mile of the project. Fourteen of these cultural resources have been identified as isolates in the record search. A prehistoric/historic site, CA-KER-2142/H, is situated less than a mile south of the westernmost portion of the project area. This site has been described as two areas of discolored soil with prehistoric artifact concentrations, including hammer stones, a biface fragment, and two obsidian stemmed corner notched projectile points, within a scatter of cryptocrystalline debitage and tools. Features include two historic or recent rock hearths with associated historic can and bottle debris. Within one and a half miles, an additional two prehistoric sites have been recorded, including one milling station and one sparse lithic scatter. These sites characterize the past prehistoric and historic use of the area, albeit somewhat infrequent and localized.

No previous studies have been performed specifically within the study area. Five studies (Applied Conservation Tech 1985; McManus 1987; Uli 1984; Schiffman 1985, and Schiffman 1987) have been located within one mile of the study area, however, and two of these recorded other segments of the Los Angeles and the Southern Pacific Railroad, both of which cross the subject property (Table 1). No other previous archaeological study is recorded for the subject property.

TABLE 1

Previous Studies Conducted in the Area of
The Fremont Valley Pipeline Project

Applied Conservation Tech.

1985 "Sylmar Expansion Project." Report on file, Southern San Joaquin Valley Archaeological Information Center.

Laylander, D.

1995 "Negative Archaeological Survey Report 09-KER-14, PM 28.3/30.2." Report on file, Southern San Joaquin Valley Archaeological Information Center.

McManus, J.

1987 "Archaeological Survey for 9-KER-14, PM 25.5-35.7." Report on file, Southern San Joaquin Valley Archaeological Information Center.

Schiffman, R.

1985 "Archaeological Investigation of Solar Worlds Wind Farm Near Cantil." Report on file, Southern San Joaquin Valley Archaeological Information Center.

1987 "Archaeological Investigation for Six Sections in Fremont Valley." Report on file, Southern San Joaquin Valley Archaeological Information Center.

Sutton, M.

1987 "Archaeological Assessment of the Six Sections in Fremont Valley." Report on file, Southern San Joaquin Valley Archaeological Information Center.

Uli, J.

1984 "Archaeological Investigation of Solar World Proposed 40 Acre Wind Turbine Generator Farm Near Cantil." Report on file, Southern San Joaquin Valley Archaeological Information Center.

IMPACT ANALYSIS

The proposed project has the potential to affect three cultural resources. These are the Los Angeles (CA-KER-3549-H), the rail line (CA-KER-3366-H and CA-INY-4607-H), and the historic scatter (FVP-1). The connection of the pipeline from the Fremont Valley Ranch wells into the Los Angeles will not compromise any historic elements or conditions that are the basis for the historic significance of this water delivery system. The connection is not an adverse impact to the historic sensitivity of the aqueduct.

Impacts to the rail line will be avoided by boring the water pipeline beneath the track bed. The boring process will not have any effect on the existing condition of the railroad or on the historic characteristics of the resources.

Impacts to the historic scatter at FVP-1 could be adverse, although this site has not been evaluated as significant. The flexibility provided to the project engineers to locate the pipeline where most advantageous, considering environmental, engineering, and land form aspects of the project, will allow the placement of the alignment from Well 50 to the storage pond in an area north of the historic site, along an existing well-traveled dirt road. By using this alignment, Site FVP-1 is no longer affected by the project, and will not be impacted.

No impacts to paleontological resources are anticipated by the construction of this project. No such resources are reported for the site area, and no indications of fossils were observed on the project site during the survey.

DISCUSSION/INTERPRETATION

The archaeological survey of the Fremont Valley Pipeline Project area resulted in the location of a single historic site, and the relocation of two previously recorded historic sites documented during the record search at the Southern San Joaquin Valley Archaeological Information Center. Registration forms for the newly-located site have been submitted to the Southern San Joaquin Valley Archaeological Information Center.

The site has been assigned the temporary designation of FVP-1. The site was not tested to determine significance because the pipeline alignment will be designed to avoid any contact with this site. It is unlikely that the site is historically significant; however, there is no need to evaluate the site because it can be avoided.

The potential for prehistoric sites within the project is very small, given the flat topography of the property and the lack of any natural resources which may have drawn prehistoric people to the site area. The Fremont Valley area appears to have been used for thousands of years by prehistoric occupants, but most evidence is limited to isolated artifacts and flake scatters reflecting the highly mobile life ways of widely dispersed hunter-gatherer groups.

MANAGEMENT CONSIDERATIONS

As currently configured, the project will not produce significant impacts to cultural resources, since the pipeline will be tunneled beneath the railroad and will not impact the historic aspects of the Los Angeles Aqueduct. The newly recorded site, FVP-1, will be avoided as long as the more major, northerly power line road is used to access Well 50. If the track directly beneath the power lines is used, the site will have to be evaluated. If these avoidance measures are taken, no further cultural resource studies are recommended. It will be recommended that an archaeologist shall be on site during the pipeline installation near Well 50 to ensure that construction crews do not impact FVP-1, which lies in close proximity to the well and pipeline. No further paleontological studies are recommended, nor will monitoring for fossils during trenching be necessary.

PERSONNEL

The archaeological survey was performed by Shelly Raven-Jennings and Jim Clifford concurrently with the paleontological survey by George Kennedy. The letter report was prepared by Brian F. Smith, Shelly Raven-Jennings, Jim Clifford, and George Kennedy.

CERTIFICATION

The information provided in this document is correct, to the best of my knowledge, and has been compiled in accordance with the guidelines of the Kern County.

Brian F. Smith — 10/13/97

Brian F. Smith, Principal Investigator — Date

REFERENCES CITED

Applied Conservation Tech.

1985 "Sylmar Expansion Project." Report on file, Southern San Joaquin Valley Archaeological Information Center.

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Laylander, D.

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Sutton, M.

1987 "Archaeological Assessment of the Six Sections in Fremont Valley." Report on file, Southern San Joaquin Valley Archaeological Information Center.

Uli, J.

1984 "Archaeological Investigation of Solar World Proposed 40 Acre Wind Turbine Generator Farm Near Cantil." Report on file, Southern San Joaquin Valley Archaeological Information Center.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION For the *BEACON SOLAR ENERGY PROJECT*	**Docket No. 08-AFC-2** **PROOF OF SERVICE *(Revised 11/10/08)***

INSTRUCTIONS: All parties shall either (1) send an original signed document plus 12 copies or (2) mail one original signed copy AND e-mail the document to the address for the Docket as shown below, AND (3) all parties shall also send a printed or electronic copy of the document, which includes a proof of service declaration to each of the individuals on the proof of service list shown below:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 07-AFC-9
1516 Ninth Street, MS-15
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DECLARATION OF SERVICE

I, April Albright, declare that on November 12, 2008, I deposited copies of the attached Draft Initial Study/Proposed Negative Declaration Samda Water Exploration Fremont Valley Ranch Water Management Project in the United States mail at Sacramento, CA with first-class postage thereon fully prepaid and addressed to those identified on the Proof of Service list above.

Transmission via electronic mail was consistent with the requirements of California Code of Regulations, title 20, sections 1209, 1209.5, and 1210. All electronic copies were sent to all those identified on the Proof of Service list above.

I declare under penalty of perjury that the foregoing is true and correct.

Original signature in Dockets
April Albright

Attachments